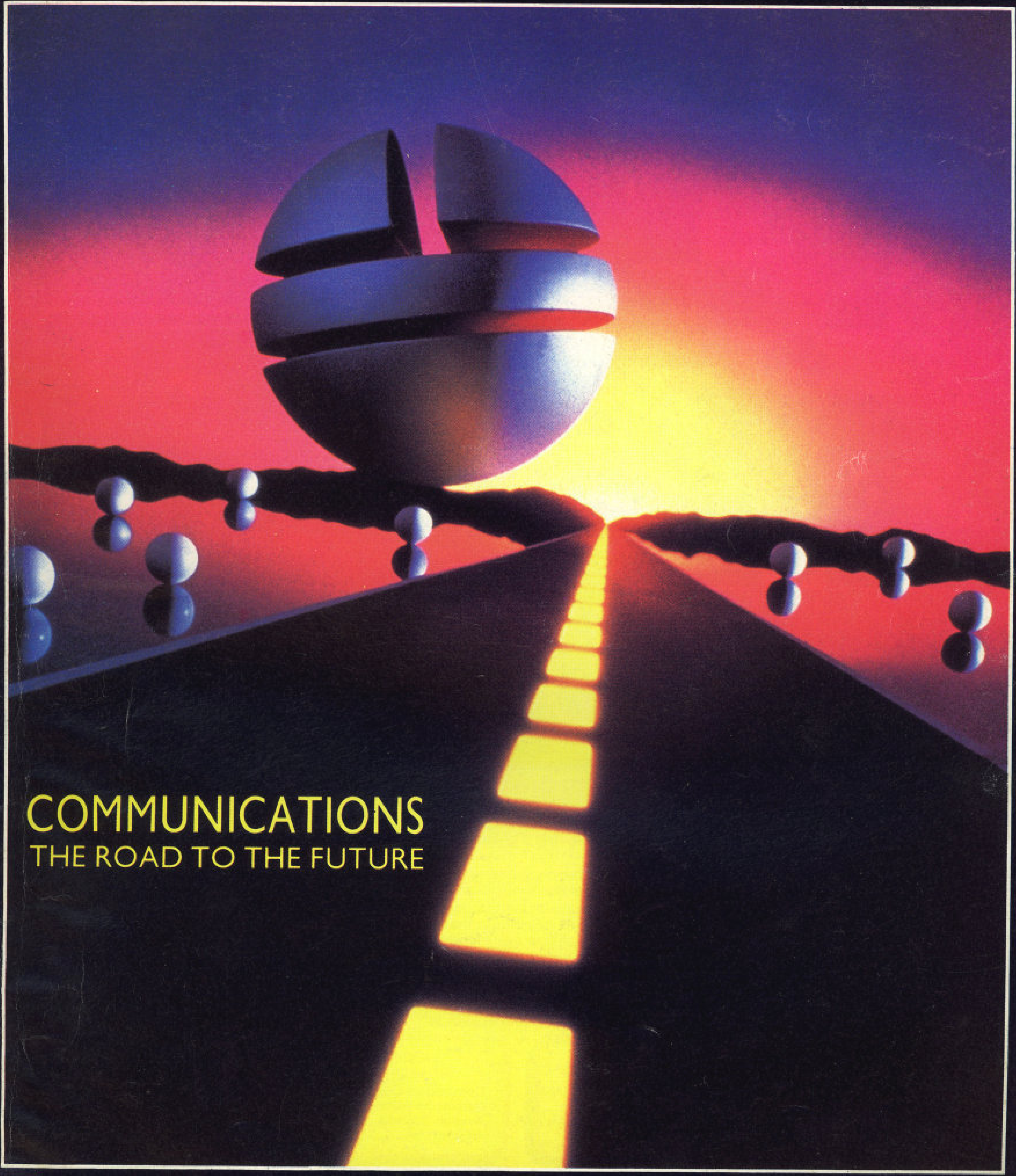
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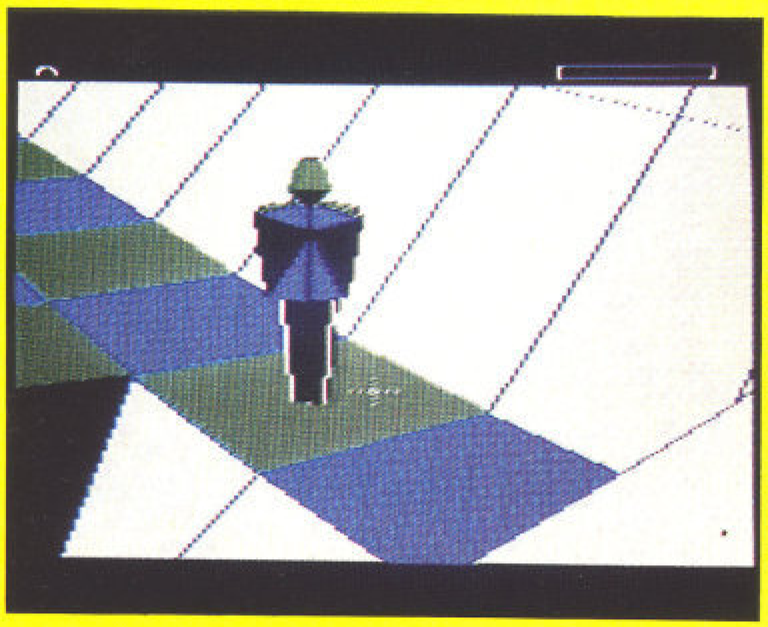
COMMUNICATIONS
THE ROAD TO THE FUTURE

- RS232 INTERFACING
- PICTURE ANIMATOR FOR THE C64
- SENTINEL—GAME OF THE MONTH
- PLUS/4 SCREEN DUMPS

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REGULARS



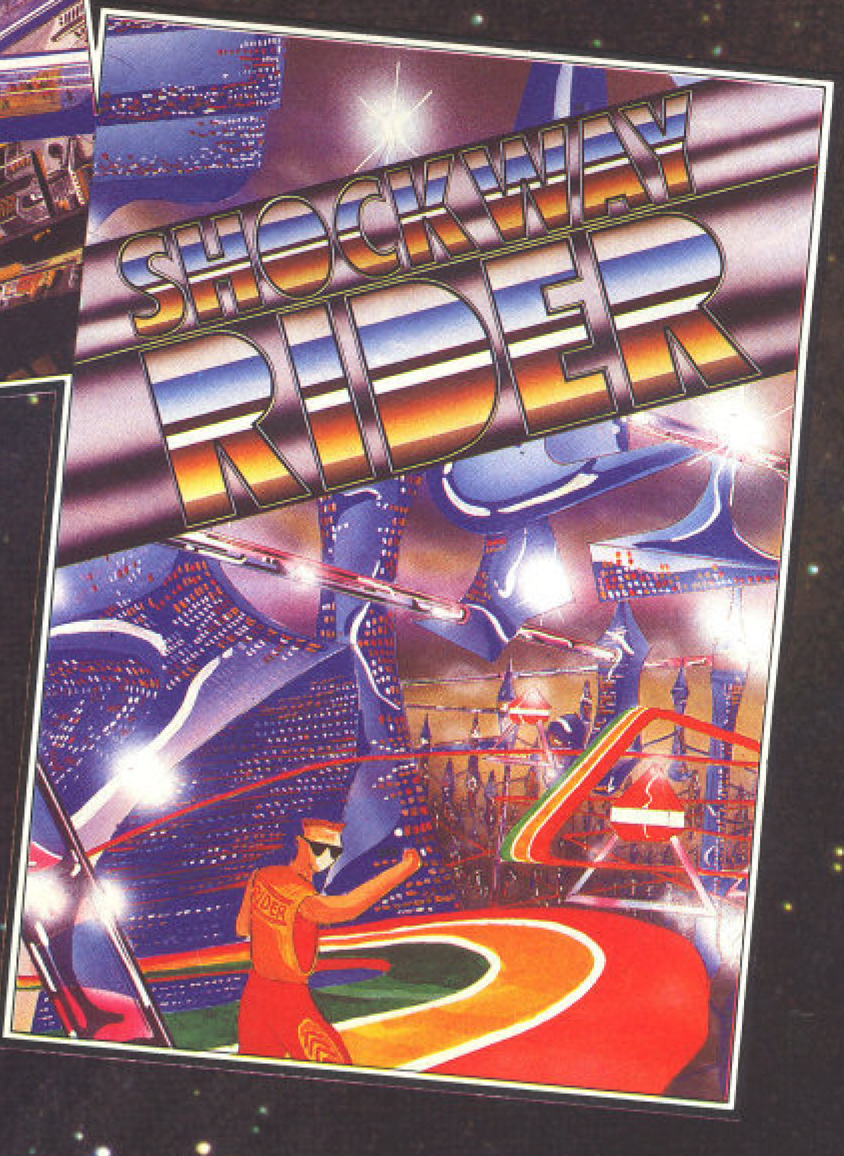
FEATURES

PROGRAMS AND UTILITIES

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DATA STATEMENTS

People on Chips

Judge Dredd is just one of the colourful characters being launched on computer at the moment. Melbourne House has set him up in Mega City 1 which is a metropolis heaving with dangerous criminals. You must track down unsolved crimes from giant apartment blocks to the city streets, to the deadly chaotic Undercity where the ruins of the 20th century still stand.

As well as the violent criminals, there are Robodogs: ancient guard mahcines escaped from their storage bunkers and running free. Sattelats are tiny robotic rats left over from the apocalypse war. And there are the rats and brutal subhuman Undercity dwellers in the lower regions of the city.

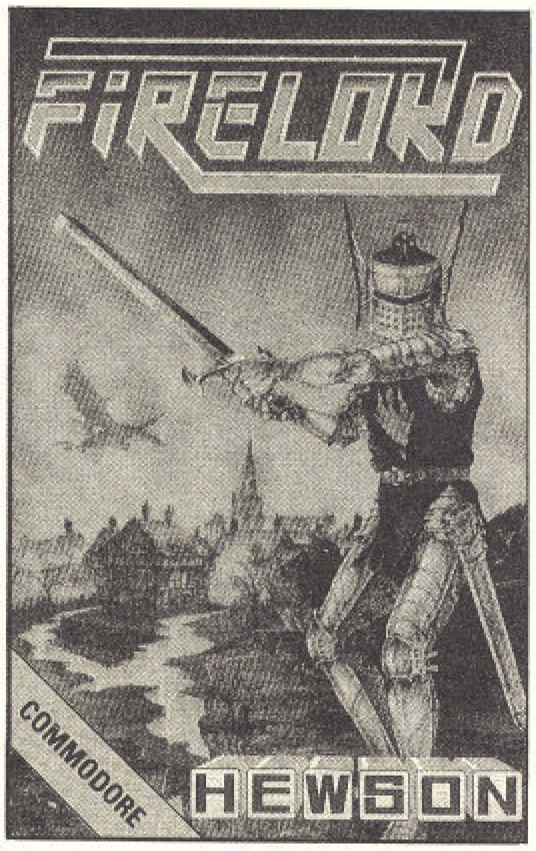
The only certain things are your judge's training and your trusty lawgiver pistol with its supply of ricochet, high explosive, armour-piercing heat-seeking bullets. It's for the C64 and is £9.95 on cassette and £12.95 on disk.

Firelord is a new C64 arcade adventure from Hewson. Set in the medieval land of Torot, the intending Firelord must save the land from the evil queen using fire power, skill and cunning. The queen has tricked the dragon into parting with the firestone and is terrorising the people with deadly fireballs. It's priced at £8.95 on cassette and £14.95 on disk.

Touchline

Melbourne House: *60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.* ***Tel:*** *01 943 2688.*

Hewson: *56B Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX.* ***Tel:*** *0235 832939.*



In On The Act

Activision is releasing a bundle of Commodore titles to see you through those long winter evenings.

Tass Times in Tonetown, has you in pursuit of your missing grandfather who disappeared leaving a cryptic message and a receipt for an anchovy and pepperoni pizza. Your quest takes you on an intra-dimensional vacation in Tonetown, an ultra-touch village filled with the tonest assortment of snousers, doods and tass cits. You have two objectives to find gramps and get tass because if you can't you'll be booted out of Tonetown. All sounds very confusing. The only way to see the light is to play it. It's £19.99 on C64/128 disk.

Labyrinth is the computer game of the Jim Henson film starring David Bowie.

In a world of magic and mystery you'll meet such characters as the Fireies, Ludo, Hoggle and Sir Didymus. You are a captive in a world of twisting mazes and corridors. You only have 13 hours to unlock the secrets of the *Labyrinth* or you'll be enslaved for ever. It's available on the C64 at £9.99.

Shanghai is a strategy challenge game based on the ancient chinese board game of Mah Jongg. It's available for the C64 at £14.99 on disk. The rules are deceptively simple. From 144 randomised picture tiles of seven different suits, players snap off matching pairs until they run out of moves. The tiles are stacked in the shape of a dragon ready for battle and players can only match tiles from the dragon's head or tail. It involves thinking as many as 20 moves in advance. There are four different options from Solitaire to a game in which any number of players can take part.

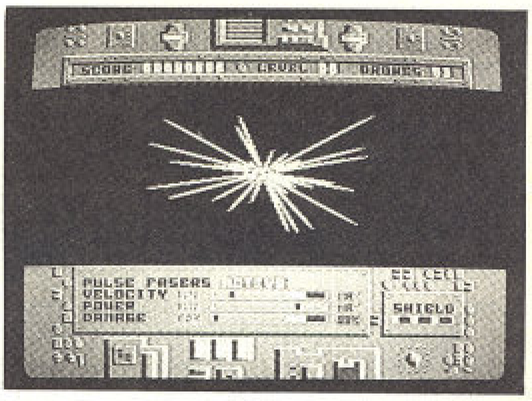
Howard the Duck, brought to life on the movie screen is now starring in his own computer game. On a remote volcanic island, Howard must try and rescue his friends from the dark overlord. Obstacle and enemies on his quest include fighting the rapids, battling the mutants and making his way to the thrilling finale. Aids to his journey are a jet-pack, his quack-fu skills, an ultralite and a lazer. It's on the C64 at £9.99 cassette and £14.99 disk.

Touchline

Activision: *23 Pond Street, Hampstead, London NW3 2PN.* ***Tel:*** *01 431 1101.*

Lots of Ariolasoft

Ever conscious of the zapping public, Ariolasoft is bringing out a whole selection of kill and main games to keep you happy during the season of good cheer and beyond.



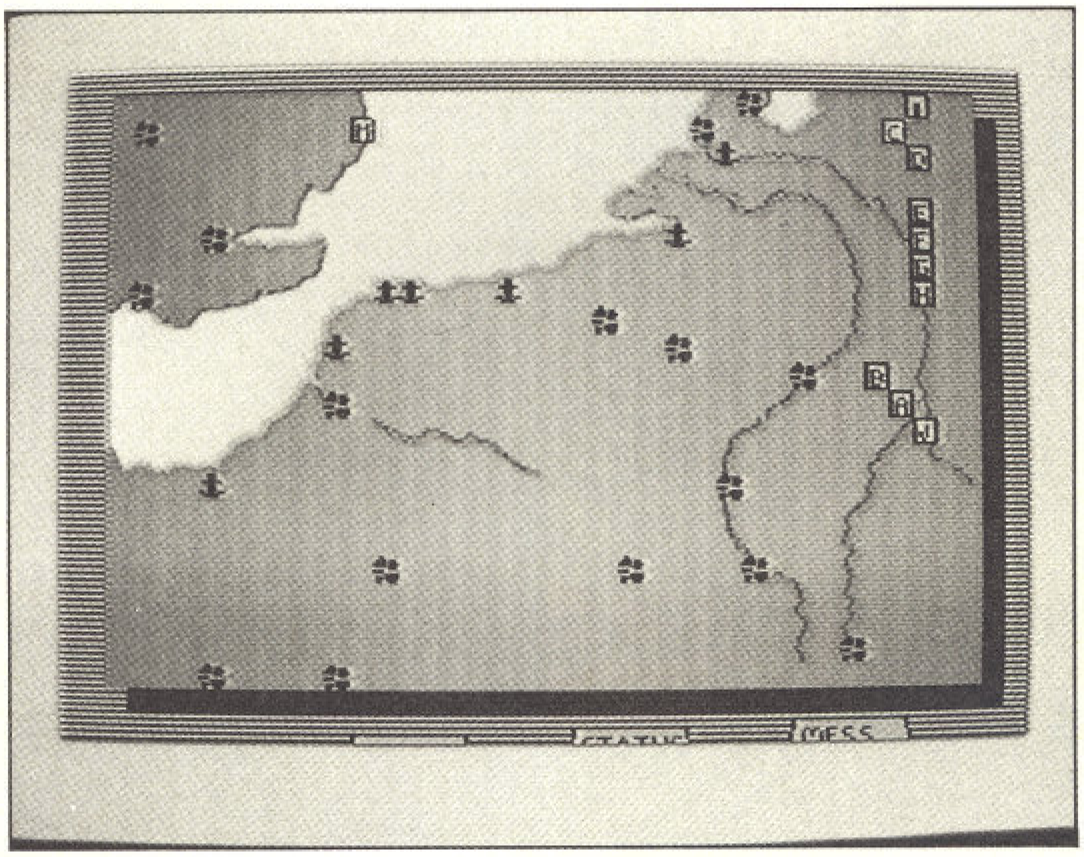
Zar jazz is a space arcade game set in a zone of the galaxy which doesn't obey any natural laws. This zone leads into an area of Crazy Space. As an undergraduate at Marsport University you have been detailed off to find out what exists at the apex of the cone shaped Crazy space.

Summed up by the words shoot 'em up with great music!

It's for the C64 and costs £9.95 on cassette and £14.95 disk.

Another zany arcade game for the C64 is *Mountie Mick's Death Ride.*

DATA STATEMENTS



Mick is a Canadian Mountie and for some reason he's dodging his way along the top of the Trans-Canadian Express. Keep your head and keep shooting is the helpful hint from Ariolasoft. It's £8.95 for the C64.

Warhouse Shoot Out is another honest to goodness, no nonsense, heads down, mindless shoot out game. This time you're a cornered gangster, fighting for your life in an old dusty warehouse. The cassette version for the C64 is £9.95, disk will cost £14.95.

There's also *Blitzkrieg* which will take you back to the action packed days of World War II. Based on the Len Deighton book of the same name, you are in command of the German forces and must attempt to invade England using the Blitzkreig strategy.

Special features include: Menu driven pop up file system, has relief graphics, historically and geographically accurate, scrolling 3D terrain, real time movement, pop up message windows. The game is available for the C64 and is £9.95 on cassette and £14.95 on disk.

Touchline
Ariolasoft: *68 Long Acre, Covent Garden, London WC2E 9JH.* ***Tel:*** *01 836 3411.*

C16 and Plus/4 News

Domark's controversial *Split Personalities* game is now available for the Plus/4. It's a computer age jigsaw in which you have to assemble pictures of the rich and famous within a frame which can hold traps. There are lots of distractions to make you lose concentration but they could help you too.

Characters featured are Margaret Thatcher with Denis, Ronald Reagan and computer industry figures such as Alan Sugar of Amstrad and the inscrutable Clive Sinclair.

The new Plus/4 version costs £8.95.

Bridgehead is a new C16 Plus/4 release from Anco. Anco promises to have you glued to your joystick with the fast action bidirectional screens.

You have been chosen from thousands of soldiers to join an elite marine unit being trained to complete a mission impossible. Your task is to secure the bridgehead. There are eight sectors to complete, each of which is heavily patrolled. Your ammunition is limited so you must raid enemy dumps to replenish your supply.

Touchline
Domark: *204 Worple Road, Wimbledon, London SW20 8PN.* ***Tel:*** *01 947 5622.*
Anco: *35 West Hill, Dartford, Kent.* ***Tel:*** *0322 92513/8.*

Communicating

From early December, Prestel Subscribers will be able to access Telecom Gold – British Telecom's electronic mail system. This follows the creation of a new X 29-based gateway link between the two services. This is the first stage in establishing full interconnection between the two networks.

The new link incorporates software that enables information sent on a 'scrolling' ASCII type terminal to be formatted in a Prestel page style.

Additional features include text editing prior to transmission and simpler access with a single gateway frame for each Telecom Gold system which takes the user straight to an ID entry point. Prestel customers wishing to access Gold will be routed from the Prestel messaging database.

As all members of Micronet are also in Prestel, this new facility is also available to them.

Touchline
Prestel Headquarters: *Telephone House, Temple Ave, London EC4Y 0H1.* ***Tel:*** *01 822 1056.*

Bumper Bargains

Compilations are always popular at this time of year and US Gold has brought out a *Shoot 'em Up* collection for the C64. There are four games on the cassette the names of which will no doubt be familiar: *Zaxxon, Dropzone, Blue Max* and *Fort Apolcalypse*. All four games can be had for £9.99 on one cassette.

Beau Jolly, a software house which specialises in compilations has recently released *Computer Hits 3*. Included on the tape are *Geoff Capes Strongman Challenge, Blagger Goes to Hollywood, Elidon, 3D Lunattack, Crazy Comets, Dynamite Dan, Herbert's Dummy Run, Attack of the Mutant Camels* and lastly *, The Adventures of Bond – Basildon Bond.*

All the games have been released in their own right previously. The compilation is a two cassette set.

Touchline
US Gold: *Unit 2/3 Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.*
Beau Jolly: *29A Bell Street, Reigate, Surrey RH2 7AD.* ***Tel:*** *07372 22003.*

DATA STATEMENTS

Bits and Pieces

Infogrames, the French games company, has a new product out. *Bridge* for the C64. It is not a game for bridge beginners but is aimed at the experienced player.

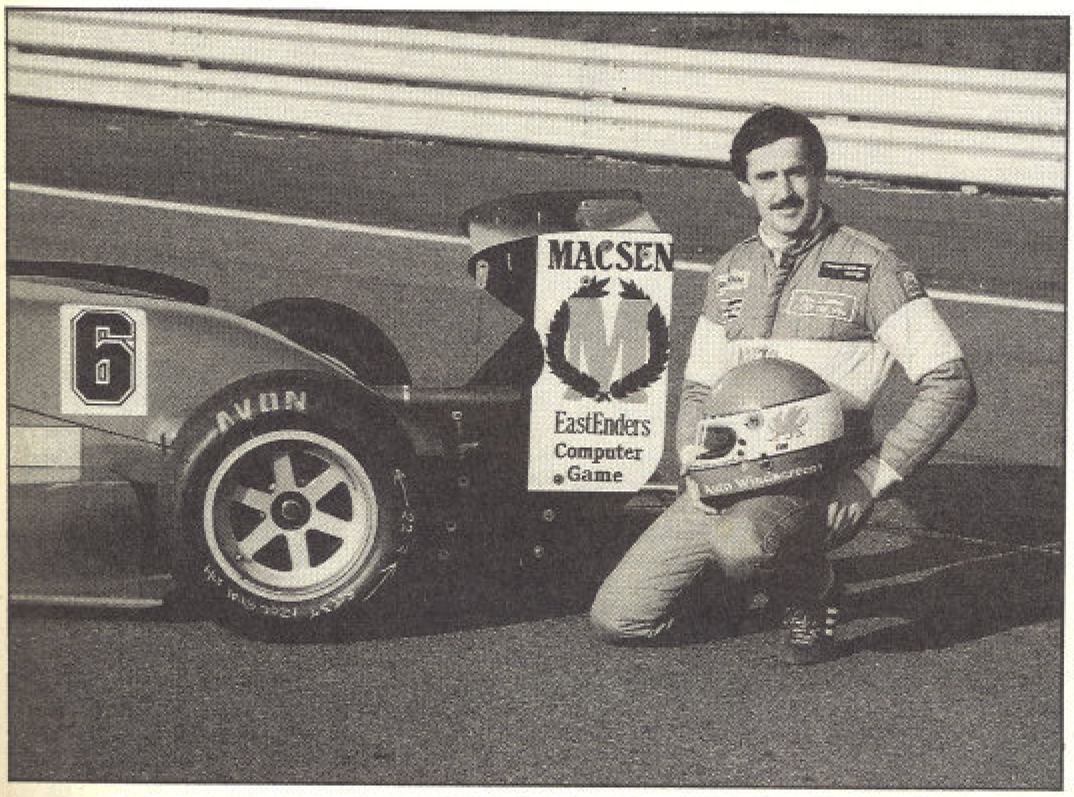
It incorporates the seven conventions recognised by most players as well as 99,999 preprogrammed deals. Other features include a scorecard, a cheat screen, replay deal function and a facility to deal specific cards to certain players.

Also from Infogames is an arcade adventure called *One*. It takes place in a babysitting arena where Alfred has been sent to look after little Valentin. Valentin is an incredibly annoying child and runs off, leaving Alfred to find his way around an enormous house and cope with all the hazards that this involves.

Macsen is releasing a C64 game based on the ever-popular BBC soap opera *Eastenders*. It will feature all your favourite characters, and the not so favourite ones and will be out soon, so keep your eyes peeled.

The Sparklers range of £1.99 budget games is being expanded with two new games for the C64. *River Rescue* is a watery simulation of a dangerous river in which you have to negotiate such hazards as river mines and drownings in an attempt to guide your motor launch into a safe haven.

Monkey Match features a half man/half monkey creature who is searching for the holy scriptures and having to fend off enemies with lightening bolts.



The Sporting Armchair

Software companies are always trying to make sports simulations more lifelike. Now New Concepts has come up with the idea of a surfing game in which you attach a mini surfboard to your keyboard and learn surfing techniques with the palm of your hand. *Surfchamp* is the game, and it has been endorsed by the British Surfing Association as a game which teaches the sport in the authorised way.

Back to more run of the mill sports, with another martial arts offering from Melbourne House. *Fist II* is the sequel to *The Way of the Exploding Fist*. Once more the Warriors of the Exploding Fist must combat evil with their fighting skills. The skills are difficult to acquire and are come by in two ways: experience and from the secret scrolls. Described by Melbourne House as arcade, adventure strategy, simulation and much more, it's out on the C64 at £9.95.

For those who like a little more variety then US Gold/Epyx has just launched *World Games*. Featuring such motley events as slalom ski-ing, caber tossing, barrel jumping, cliff diving and much more. Sorry no welly throwing.

It's out now and costs £9.99 on C64 cassette and £14.99 on disk.

Touchline

New Concepts: *37 Dublin Street, Carlow, Ireland.* ***Tel:*** *010359 32492.*

Melbourne House: *60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.* ***Tel:*** *01 943 3911.*

US Gold: *Unit 2/3 Holford Way, Holford, Birmingham. B6 7AX.* ***Tel:*** *021 356 3388.*

Adventure Creations

Incentive Software has now launched a new label to cater for games written with the successful *Graphic Adventure Creator*.

Winter Wonderland is the first of two new releases on the new label. It's an adventure set in the Himalayas and you must locate a lost civilisation which is apparently running parallel to your own but independently. The adventure begins with a plane crash and once the civilisation has been located your attempts to escape back to normality begins. Just released, it's £7.95 on the C64.



The other release on the Medallion label is *Apache Gold* in which you battle against the people and circumstances in the wild west. It's also £7.95 on the C64.

Both these games are winners of the Gold Medallion award, presented by Incentive for the best games produced using the *GAC* which has recently topped the worldwide £1 million sales mark.

Touchline

Incentive: *54 London Street, Reading, Berks RG1 4SQ.* ***Tel:*** *0734 591678.*

DATA STATEMENTS



Touchline
CRL: 9 Kings Yard, Carpenters Road, London E15 2HD. ***Tel:*** *01 533 2918.*

Stop Press

CRL has released the first ever censored computer game. *Dracula* has been issued with a 15 certificate by the British Board of Film classification.

Based on the book by Bram Stoker, *Dracula* was released on hallowe'en. Although the game is both a graphics and text adventure but it was primarily the horrific language of the text which caused the British Board of Film Classification to make this unprecedented move.

Rod Pike, writer and programmer of *Dracula* and himself a parent, alerted CRL to the fact that the program may be unsuitable for younger children.

"After seeing the finished game myself, I felt that the only responsible action was to seek legal advice." said Clement Chambers, CRL's MD.

Also new from CRL is *Murder Off Miami*, a solve-it-yourself mystery based on the Dennis Wheatley novel of the same name.

Set in the 1930s, you play Detective Kettering called in to investigate an alleged suicide. The death occurred in a boat off the coast of Miami and you have to decide 'did he fall or was he pushed?'. It's available now priced £7.95.

Not So Trivial

Domark, having achieved great success with the computer game of *Trivial Pursuit*, has now announced the release of a *Young Players Edition.*

All the original features have been retained, the range and variety of questions, the character T.P., the original graphics and the no-keyboard play. On cassette for the C64, the new edition is £14.95. On disk it costs £19.95.

Also imminent is the launch of a new Domark label, Streetwise. Mark Strachan of Domark said: "We feel that the Domark name is associated with high profile licenced games such as *A View to a Kill* and *Trivial Pursuit.* This will continue to be so, and the Streetwise label will be reserved for arcade style titles. The first two Streetwise titles are *Orbix the Terrorball* and *Kat-trap.* YC

Touchline
Domark: *204, Worple Road, Wimbledon, London SW20 8PN.* ***Tel:*** *01 947 5622.*

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TIMEWORKS

Comms for Beginners

Everyone has heard of computer communications but a lot of people find this a bewildering subject. Our guide will explain the basics and show you how to get started.

By David Janda

Communications has been the most popular trend in computing for the past two years, and judging by the sales of modems and such like, it would appear that more and more people are getting involved in this very exciting aspect of new technology.

Computer communications, or 'comms' is a very broad subject. It covers everything from getting your micro connected up to a modem to extracting information from the many online databases - and that's a lot.

One of the first questions I get asked about comms is 'why bother?' Well, comms is informative, fast and fun! You could use computer communications to get online to one of the many voluntarily public bulletin boards that are in operation in this country and abroad. Alternatively you could subscribe to one of the growing number of electronic magazines that are becoming available. Business users might prefer to subscribe to one of the many electronic mail services that allow you to send and receive information worldwide, instantly at the touch of a button.

What you get out of comms all depends on what you want, and are using. Casual chit-chat is often to be found on the bulletin boards, whilst the commercial services such as *Micronet* and *Compunet* offer technical, entertaining and educational services. Business users can definitely benefit from comms. It has been said that information is power, and those who get the information first have the edge. Comms enable you to do this by accessing one of the many commercial services that provide information covering diverse subjects ranging from weather forecasts to stocks and shares.

One thing is certain. The best method of getting to grips with computer communications is by giving it a try yourself. This article can only point you in the right direction, the rest is up to you.

The Nuts and Bolts

The biggest hurdle in understanding comms is getting your micro connected to the phone system (PTSN - Public Telephone Switched Network). The obstacles in your way are connecting the micro to a modem, selecting some comms software and trying to understand the jargon (much of it useless) that surrounds the subject.

Luckily enough for us Commodore owners the Commodore 64/128/128D is well equipped to communicate with the outside world.

All computers represent information in a digital manner, as a series of on and offs, ones and zeros. Not only that, but information is transferred internally within the micro in a parallel manner - normally eight 'bits' at a time. Unfortunately to communicate with another micro the telephone





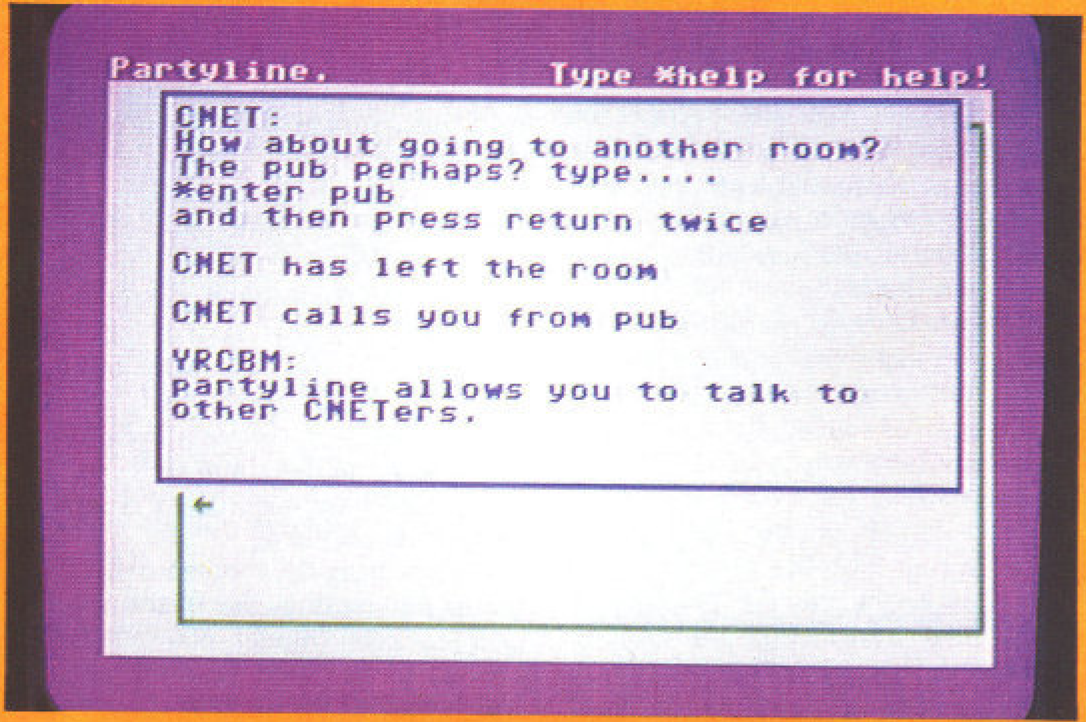
system has to be used. I say unfortunately because the telephone system only allows analogue information (noise) to be transmitted over it. Not only that, but the information must be sent one bit at a time in a sequential manner.

To meet these requirements the micro needs to send and receive the information one bit at a time. Looking at the back of a Commodore 64/C128/128D you can see the user port and the cartridge port. These two interfaces are used to plug in the modem which will convert the micros digital signals to analogue information.

At this point it's worth pointing out that here in the UK most comms software packages are supplied in cartridge form. The cartridge includes some electronics and a cable that connects to a modem. The cartridge is all that is necessary to convert the signals to and from the modem, and the advantage of this method is that the software is available when the micro is powered up. The *Mustang* cartridge from Y2 computing is an example of this method.

In other countries – mainly in the USA – an RS232 interface board is widely used which plugs into the user port. Basically, an RS232 interface is a piece of electronics which sends and receives information sequentially – one bit at a time. Although using the RS232 interface is considered to be more cumbersome (it requires an additional cable and software to be loaded from tape or disk) it is more flexible. This is because much of the software necessary to drive the RS232 unit is already within your Commodore's kernal thus enabling you to program your own comms applications. Using the RS232 unit also enables you to use another printer, or transfer files between another computer in the same room.

A number of packages rely on an RS232 adaptor to be fitted. Examples include *Homepak* (reviewed in the June issue of *Your Commodore*) and *Your Commodore's* very own *Telephone Exchange* which appeared in the April and May issues. Many public domain (free) comms packages rely on an RS232 interface to be fitted, and if you ever wish to use one of the more expensive modems which are fitted with a D type connector then it's best to use it with an RS232 interface.





Which Modem?

After deciding how you want to connect your micro to the modem – cartridge or interface – you need the modem itself.

This will be your critical purchase, as you can pay as little as £30 or as much as £60. Before buying a modem you need to decide in advance whether you will use it on a regular bases or just casually. Different modems communicate at different speeds and generally speaking the faster it can operate the more it will cost. The advantage being the faster it can send and receive information the quicker you can get the information you want, and at todays rates for telephone charges that's an important factor to consider.

The range of speeds that modems operate at varies between each model, but the baud rates, as they are known, are common. Typical speeds, or baud rates include: 300/300, 1200/1200 (half-duplex) 1200/75, 75/1200. The more expensive models can operate at 1200/1200 full-duplex and even 2400/2400 as is the case with the Pace *Series Four 2400S*.

The buzz-terms half-duplex and full-duplex mean that data can only be transferred one way at any given time in the case of half-duplex, and both ways simultaneously with full duplex. Modems which offer 1200/1200 half-duplex normally require some special software that switches between sending and receiving, and is normally only used when transferring information between two people, often referred to as user-to-user. In the case of 1200/75 baud the computer you call will transmit information to your micro at 1200 baud full-duplex whilst your computer will transmit at 75 baud. To get these baud rates into perspective a general rule of thumb can be used by dividing the baud rate by 10 to get the number of characters of information per second. So 1200 baud roughly means that 120 characters of information will be transferred each second.

Most modems operate at dual baud rates i.e. they can operate at a number of speeds. Typically this would be 300/300, 1200/75 and 1200/1200 half-duplex. Most services operate at specific speeds, and as a general rule the following applies:

Bulletin boards – 300/300, some also at 1200/75
Viewdata services – 1200/75
Electronic mail – 300/300, 1200/1200 (full), some 1200/75

Looking at the above list you can see that the type of service you use should be taken into account when you purchase a modem. If, for example you wish to access Viewdata services such as Micronet/Prestel then it is essential that your modem is capable of operating at 1200/75 baud. On the other hand, if you wish to use the electronic mail (Email) or online databases then it is best to purchase a modem that can operate at 1200/1200 full-duplex as this is four times faster than the 300 baud models and it will enable you to send and receive information more rapidly thus saving time and telephone charges.

Some modems are supplied with an auto-dial option enabling the telephone number to be entered at the keyboard rather than manually dialled. And auto-answer option will do just that – automatically answer the phone upon an incoming call. Other more exotic features are auto baud-rate scan which enables the modem to automatically set itself to the correct baud-rate when the host system has been connected to. This saves a lot of knob twiddling on the user's part. The up market range of modems even allow frequently dialled numbers to be stored internally as well as complete control via software.

Connecting the modem to the telephone line requires one of the new BT jack sockets (model 600 telephone socket) to be fitted near the area in which the modem is to be used. If the modem is fitted with a telephone socket then the handset is connected to the modem and the modem to the wall socket. If this is not the case then it will be necessary to install two wall sockets (one for the modem and the other for the handset) or use a splitter.

Whatever modem you choose make sure it is BABT approved. This is established by checking for a green approval sticker which will have an approval number on it. Use of equipment that is not approved is currently an offence.

Choosing the Right Software

Currently there are two comms software standards in use in the UK; scrolling and viewdata. Broadly speaking scrolling software displays only characters in one colour with the text scrolling as more information is sent/received. Viewdata displays pages of information in colour with low resolution graphics.

Each type of standard merits its own features and there are certain items which you should look out for when buying a comms package on disk, tape or cartridge.

Scrolling software (also known as dumb terminal) should allow baud rates to be set by the user. It should operate in half or full-duplex mode and accept all the common ASCII control codes including BELL (ASCII 7). Also check that the software will enable you to specify between ASCII and PETASCII. Some means of saving incoming data in ASCII format should be available, and ideally a facility enabling the user to prepare text messages offline should also be provided.

Because the PTSN was not designed for computers errors in the transmitted data often occur. To get round this the length of the data word can be set (usually to eight bits). Other it including start and stop bits as well as parity should also be user selectable. However, even with parity and stop bits set up the error checking is very much a half-way house. Errors will still occasionally creap in and this can be a problem when transmitting files. An error checking protocol called XMODEM (also known as MODEM7) is very common in comms packages and it allows text and program files to be transferred error free. This is accomplished by sending the file in small blocks. Should a block be corrupted during transfer the receiving end will detect the error and automatically request the packet again.

Other features to look out for are an online clock which is useful for keeping track of how long you have been online. Split screen operation divides the screen into two parts with the upper part of the screen used for displaying incoming data while the lower two or three lines at the bottom are used for user input which will be transmitted. This feature is especially useful when playing online adventure such as *MUD (Multi User Dungeon)*, or when using an online CB simulator. Of particular use is a directory in which you can store frequently used numbers on disk as well as the parameters for the particular service (word length, parity etc). When used with an auto-

dial modem it enables you to select a service by pressing a key. This will dial the modem and set up the software appropriately.

The viewdata standard is radically different to the scrolling type of software. Although viewdata systems operate at 1200/75 baud an option to set the speed to a different baud rate is particularly handy as *Prestel* which is the largest viewdata system in the UK will soon introduce multiple baud rates including 300/300, 1200/1200 full-duplex operation. Also of particular use is a 'reverse *Prestel*' rate of 75/1200. In this mode your computer acts as if it were *Prestel* and the caller would call your number as if they were using *Prestel*.

Features to look out for in all *Prestel* packages include page refresh for when data becomes corrupted, a previous page facility and some means of tagging pages. Frame tagging allows the software to remember particular pages that can be recalled at the press of a button. An option to save a frame to disk is also essential.

A major feature of most viewdata systems is telesoftware. Basically telesoftware is software that can be downloaded and saved to disk or tape. For the Commodore range of micros a special telesoftware downloader format has been developed by Micronet called Mustang. This is the standard for all viewdata telesoftware for the Commodore machines and is found in many packages. Readers are advised not to purchase viewdata software that doesn't have a downloader of the *Mustang* variety.

One other feature worth looking out for is an offline mailbox editor. This enables you to prepare mailbox messages offline and then send them when logged on.

It's worth noting that comms packages that incorporate both types of standard are bound to lack some of the features mentioned above due to lack of available memory.

A final note about software selection. There are literally hundreds of pieces of comms software for the Commodore range of micros available in the public domain. In other words free. These can usually be obtained from user groups or clubs such as *ICPUG* or *CLUB 64*.

What's Out There?

The number and type of services available is almost unlimited. Remember, computer communications knows no boundary and it is just as easy to dial up a bulletin board in Australia as it is to dial one locally. However, the types of service available can roughly be split into three categories; bulletin boards, databases and Email systems.

Bulletin Boards

These were amongst the first services in this country. Basically a bulletin board is what the name suggests; a public bulletin board, except electronic. The BB is a special piece of software which runs automatically on the micro. They are of the scrolling type and normally operate at 300 baud full-duplex. The BBs are run by enthusiasts in their own time, and allow one person to use the board at any, given time for about 15-20 minutes. A board will offer an electronic mail system as well as a public messaging service. Other features to be found on BBs include special interest groups (SIGs) which are areas on the board dedicated to one particular subject such as computing, fishing or whatever. A large number of BBs offer free software which can be downloaded in either ASCII or XMODEM format. The good thing about BBs is that there is a wide choice of them to log on to and they are not run with commercial interest in mind. Not only that but they are only a phone call away!

Databases

These are commerical ventures and usually require you to subscribe before access is permitted. Subscription charges differ from service to service and are also governed by the type of information they provide. Hobbiest/Home DBs such as *Micronet* and *Compunet* offer the micro user a wealth of information and software – some of which is free. These DBs also offer other type of value added services such as a private mailbox for each subscriber as well as interactive games and public messaging facilities. In the case of Micronet/Prestel the service is of the viewdata standard while on the other hand Compunet operates on its own protocol.

The DBs which are aimed towards the business sector tend to be of the scrolling format and are rather expensive to subscribe to. Information supplied depends on the individual DB and this can include references to publications, share prices, legal cross referencing and so on. Many offer very powerful search and cross reference facilities. This type of service is of particular use to the business user and those who are engaged in research.

Electronic Mail

Better known as Email systems. These are set up for the purpose of individuals to transfer information to others via the Email service. Again this type of service is usually of the scrolling type and is best accessed with a 1200/1200 full-dupex modem. Email systems such as *BT Gold*, *One-To-One* and *Easylink* offer very comprehensive message handling services as well as telex, radio paging, telemessages and so on. Most offer text orientated services such as spelling checkers, language translation services mailshot preparation and such like. The distinction between DBs and Email system is very blurred as the two tend to offer features that the other type has. Most Email systems are geared towards companies and individuals who have a lot of text they wish to transfer, however an increasing number of private individuals are now beginning to see the benefits of these services.

But Best of All

The best type of service is the one that you and your friends can provide yourself. User-to-user communication is great fun. Both you and a friend arrange that one dials another at a predetermined time (and baud rate). The idea is not to kill the art of conversation (never talk to a terminal when you can talk to the person themselves) but to get used to the idea of communicating. U2U can aslso be used to transfer your own programs and text between each other and can be especially useful for making those emergency backups we all like to do now and then.

Whatever you do do in the comms world have fun!

David Janda can be reached on the following services: *Prestel/Micronet* 017374190, *One-To-One* 13419001, *Gold/Microlink* 72:MAG95307 and *Compunet* D. JANDA.

BB List

Here are the telephone numbers for

NAME	TELEPHONE	RATES
BABS 1	0394 276306	300
Brixton Itec	01 735 6153	V/Data
Cardif ITec	0222 464 725	V/Data
C-View	0702 546373	V/Data
FBBS Swansea	0792 203953	300
Gnome at Home	01 888 8894	V/Data
Hackney BB	01 985 3322	V/Data
Haunting Thunder	0752 364059	300
Livingston BBs	050 638526	300
London BB	01 455 6607	300/12-75
London Underground	01 863 0198	300/1200-75
Mactel	01 341 1719	300
Mailbox-80 (Liverpool)	051 428 8924	300/1200-75
Metrotel	01 941 4285	V/Data
Norview	0604 20441	V/Data
TBBS Blandford	0258 54494	300
TBBS London	01 348 9400	300/1200-75/1200-1200

some of the more popular BBs. V/Data in the rates column indicates that viewdata software will be needed to access the service.

Comms Software

Numerous packages are available for the Commodore 64/C128/128D. Here is just a small selection of the more popular ones.

Mustang – A viewdata package for use with the Commodore modem. Features telesoftware downloader and offline mailbox editor as well as very good screen-dump routines. See October issue of *Your Commodore* for free offer to *Compunet* subscribers. Available on disk and cassette from: *Micronet 800*, 278-3143. Price: £11.95 disk, £8.95 cassette.

Y2 Mustang 32 cartridge – Incorporates all the features of the above but also has dumb terminal software as well. Other features include auto-dial/answer detection and directory. A cable leading from the cartridge connects to the modem via an RS423 socket. Can also be used with BB software also available from Y2 computing (£69.95 ex VAT). Available from Modem House, (0392) 213355. Price £49.95.

HomeTerm – Part of the *HomePak* package from US outfit Batteries included and sold over here by Ariolasoft. *HomeTerm* requires an RS232 adaptor to be fitted and operates at 300/300 and 1200/1200 full-duplex. The package also features XMODEM file transfer and a special graphics mode called Viditex that is used when on CompuServe.

NOTE – There is a tremendous amount of free public domain comms software available for the Commodore micros. Two very good sources are *ICPUG* and *CLUB 64*. Membership is £12 per year which includes three disks of software of your choice from their library.

Modems

Commodore Modem – Operates at 1200/75 and 1200/1200 half-duplex. Contains ROM software and editor specifically written for *Compunet*. Can also be used with scrolling software (extra) and *Mustang* disk to get across to *Micronet/Prestel*. Price ranges from £35 to £70 for the same thing so shop around! Contact *Modem House* or *Compunet*.

Enterprise 1 & 2 – A superior version of the *Voyager* series. *Enterprise 1* offers 300/300 and 1200/75, *Enterprise 2* also features 1200/1200 full-duplex. Prices £114.95 inc VAT and £287.45 inc VAT respectivley. Available from Kirk Automation Ltd.

Series Four – This is a series of professional modems with just about everything you could ever want. Can be upgraded to a 2400/2400 fully buffered Hayes compatible modem with printer port. Prices start from £250, available from Pace.

Multimodem – Cartridge with inbuilt software and modem. Plugs into the cartridge and lead fits into telephone socket. Speeds include 300/300, 1200/75, 75/1200. Viewdata and scrolling software. Price £98.50 exc. VAT. Available from Miracle Technology.

NOTE – Outline services such as *Micronet* and *Compunet* have special deals on Modems for those who subscribe to their services for a whole year.

Online Services

Micronet 800 – £16.50 per quarter gets you access to Micronet as well as the rest of Prestel. Features include mailbox, chatlines, MUD, software etc. Soon to have a link to *Telecom Gold*. Special features include local call access and free usage in evenings and at weekends.

Compunet – Databse dedicated to Commodore 64 and C128 owners. Bags of free software to download including demos, music etc. Need Commodore modem to access it. Special featrures include *MUD*, Party-line. Three tier subscription.

Microlink – A database within a database. Operated as part of *Telecom Gold Microlink* is the cheapest way of getting onto a dedicated Email system (that also offers online databses as well). Besides all of Gold's features there is a speical area just for Microlink subscribers. Special features include Telemessages, Telex, Email, bulletin board and a US link to Mnematics DB in USA. One off fee of £5 plus £3 monthly minimum.

NOTE – There are quite a few 'hidden costs' involved when using the above mentioned services and readers are advised to request written details of all charges before subscribing.

Touchline:
Prestel: *Telephone House, Temple Ave, London EC41 0HL. Tel: 822 1122.* ***Micronet:*** *8 Herbal Hill, London EC1R 5EJ. Tel: 01 278 3142.* ***ICPUG:*** *Membership Secretary, 30 Brancaster Road, Newbury Park, Ilford, Essex IG2 7EP.* ***Club 64:*** *85 Upper Drumcondra Road, Dublin 9 Ireland.* ***Miracle Technology:*** *St Peters St, Ipswich IP1 1XB. Tel: 0437 216141.* ***Database Publications:*** *Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. Tel: 061 429 8008.*
Commodore UK: *1 Hunters Road, Weldon, Corby, Northants NN17 1QX. Tel: 0536 205555.* ***Pace:*** *Tel: 0274 488211.* ***Compunet:*** *Tel: 01 965 8866.* ***Modem House:*** *Tel: 0392 213355.* ***Ariolasoft:*** *68 Long Acre, Covent Garden, London WC2E 9JH. Tel: 01 836 3411.* YC



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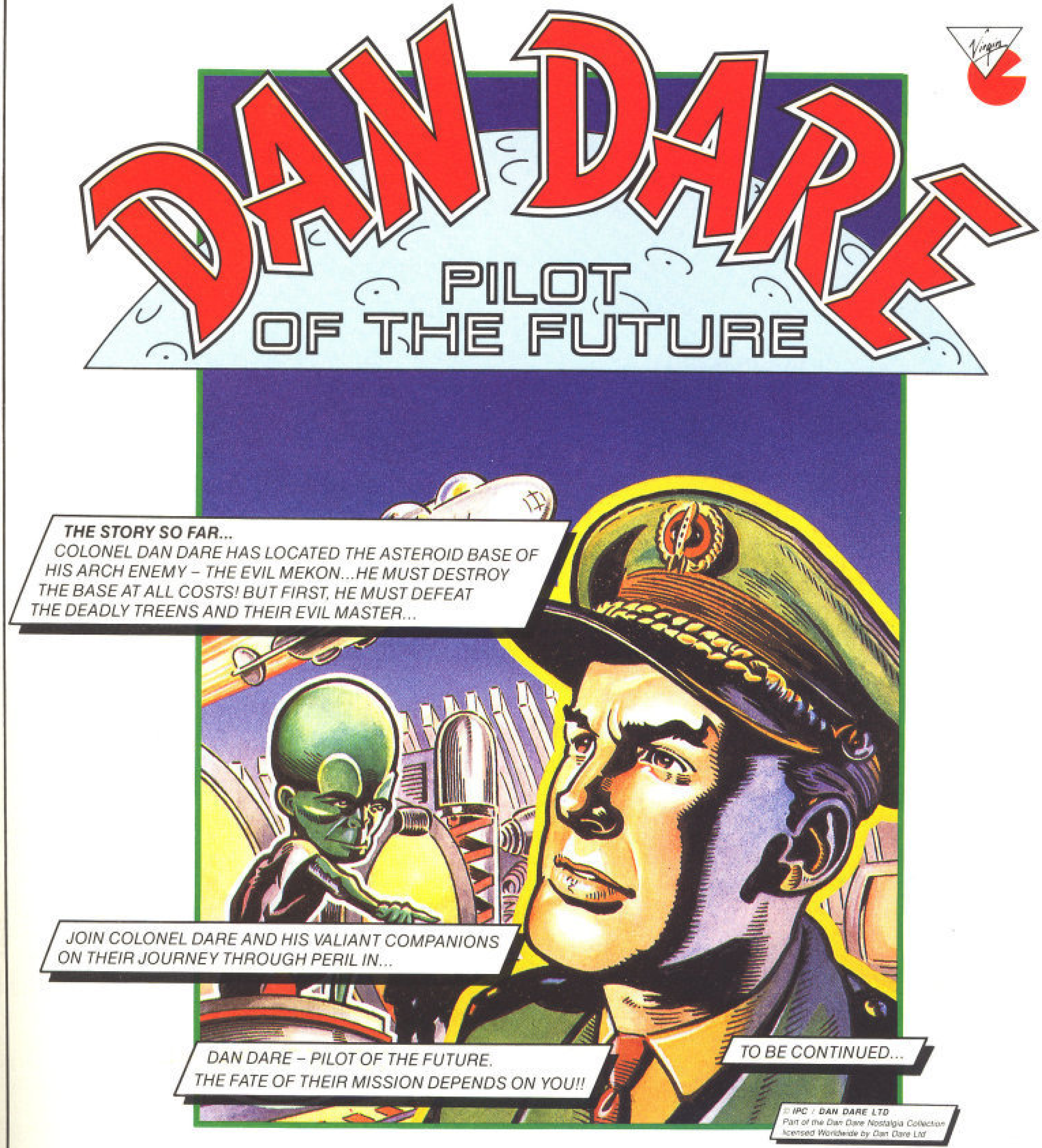
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Club 128

Plug in your 128, connect up your modem and read on for the latest news from Compunet.

By Neil Day

Anyone who saw the Commodore modems going down like oiled oysters at the Independent Compunet Club Stall at the Manchester Show will understand why some people are murmuring that the system has been under a bit of strain over the last few weeks. The free modem offer has attracted a lot of new subscribers, and an expanded user base can only be good news for all of us in the long run. In the short term, however, the system has been labouring a bit more heavily than usual at certain times.

Night-owls hardly notice any difference, and on a Sunday midmorning to lunchtime session I found it very fast indeed. However, it is appreciably slower sometimes, especially in the evening. When demand has increased on previous occasions, Compunet has been brought back up to speed pretty quickly. Let's hope that things are whiffling along again by the time you read this.

Updates

Grovelling apologies are offered for several frames that have been mentioned in earlier articles and have either lapsed or been moved between the time of writing this column and its publication. The problem is inherent in trying to use paper and ink to keep up with a fast moving computer data base. *Your Commodore* has very obligingly let me use their area, (GOTO YRCBM) to upload a series of *CLUB 128 UPDATES*. These will bring the latest news on the whereabouts of these wandering frames.

Please check it a couple of days after this article appears.

C128 Index

In a previous Club 128 column I mentioned indices and director frames.



Recently a new service has started which will be of particular interest to C128 owners. At frame 172255, *128 News Update*, you should see an upload by PJM82. It is called *128 Software Index* and contains a list of C128 programs available off Compunet. PJM82 requests anyone who uploads a C128 program to courier him with its location for inclusion in his list. If there is sufficient interest, he will continue the service wh ich is an excellent one. A few nine votes wouldn't go amiss either in encouraging this worthy venture!

Characteristics

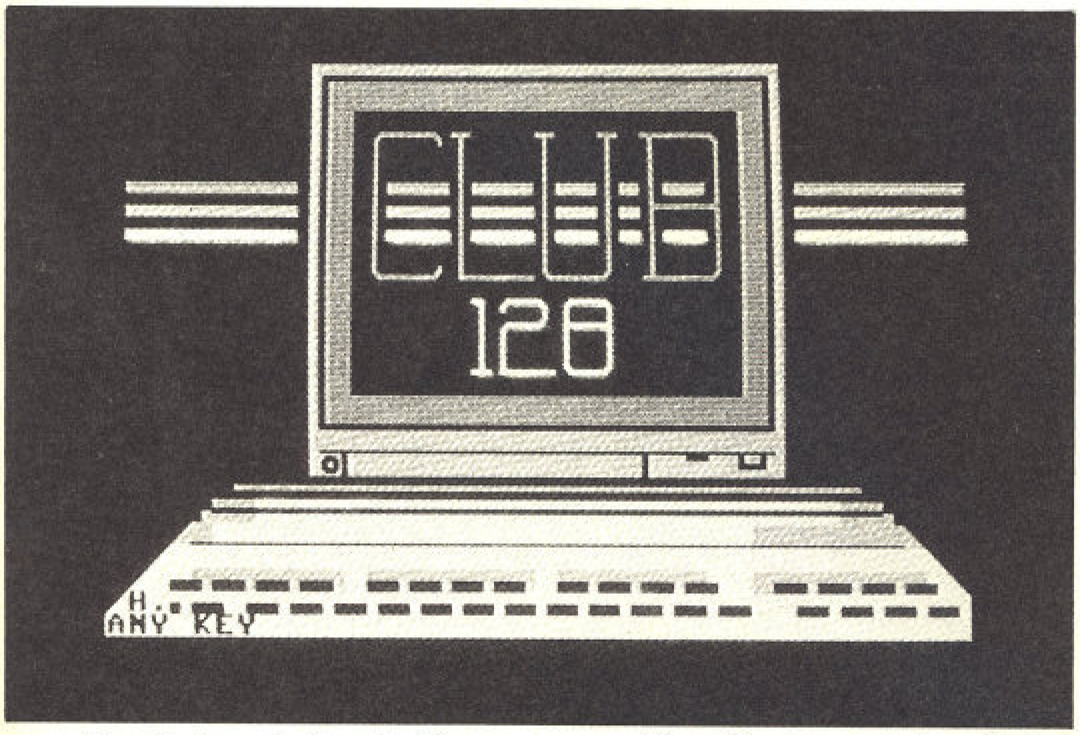
An easy-to-use character editor called "Chared" is available free of charge at frame 203574. This nifty little utility modifies letters from the C64 character set and can relocate them in memory. It shows you the results of your labours on the screen as you work. I am a bit dim about things graphical ("visually illiterate" is the usual diagnosis) so I was puzzled to find my screen filling up with hundreds of queer dots and specks while I was modifying a character. It looked as if the monitor had a terminal case of chicken pox! The dots got bigger and bigger as I added more pixels to the character I was currently defining. After pondering this for an embarrassingly long time, I finally realised that I was modifying character number 32, the space. This is the code for the characters on the blank bits of the screen!

The author, LAF1, does a little professional programming and has written some entertaining educational programs nicely targetted for pre-schoolers. GOTO EDUC and DIR the frame titled PRESCHOOL (182947). There are charges for these programs.

Mach 1

Your Commodore readers will remember the *Mach Assembler* which was published in the magazine. As I write, this program is still available in the *Your Commodore* directory (GOTO YRCBM and DIR "Software"). SC1 has been working on an updated version called the *Machine Language Development System (MLDS)*. This is available for £2 at frame 203944. The new version has several extended features and is not upwardly compatible with the *Mach Assembler.*

In comparison with other assembler and monitor packages it is



very attractively priced and offers a good way for learners to start off with machine code. But be warned that the instructions are not intended for beginners. My own favourite teach-yourself machine language book is by Jim Butterfield: *Machine Language for the Commodore 64 and other Commodore Computers*, published by Prentice Hall, ISBN 0-89303-652-8.

Magazine Reviews

Finally, a bare-faced plug for a directory I jointly edit with RJM82: GOTO MAGS will take you to a series of short reviews and notes about items in computer magazines that bear on Commodore machines. RJM82 does the useful work: he covers the main magazines from the US, and provides a very welcome service as it is often hard to find these in the shops. We also try to review the serious British magazines, and focus more applications and programming than on games. If you see a magazine, or even an item in a magazine that you think could be of interest to other Chetters, drop me a mailbox with a description and I will upload it.

Remember that Chetting is like sea netting, you never know what you'll haul in until you try. If you find something likely to be of interest, to Club 128 users, please courier me (Neil Day NADZ). YC

Sense of Adventure

Adventures are still pouring out of the software houses and boggling the minds of fans. Your Commodore brings some much needed aid.

by Pete Freebrey

Telarium is an American software house which is only now making any appreciable headway in this country. The software is not cheap but usually offers something different from regular adventure games found on the shelves. Only disk based versions are available and the three that I have come across are *Amazon*, *Nine Princes in Amber* and *Perry Mason – The Case of the Mandarin Murder*.

Amazon is based on a plot written by science fiction author, Michael Crichton, who is better known for his novels *The Andromeda Strain* and *The Terminal Man*. The game starts with the destruction of an archaeological team in the Amazon jungle. This same team was to have investigated the lost city of Chak, where it was thought they might find a rare form of emerald.

This type of emerald is particularly important in various hi-tech applications concerning national defence. This explains the involvement of National Satellite Resource Technology (NSRT), a top-secret, research and consulting firm. You play an operative for this organisation, who was to be sent out to the doomed expedition.

Immediately after the communication confirming that something is terribly wrong, you are sent on a one man mission to sort things out.

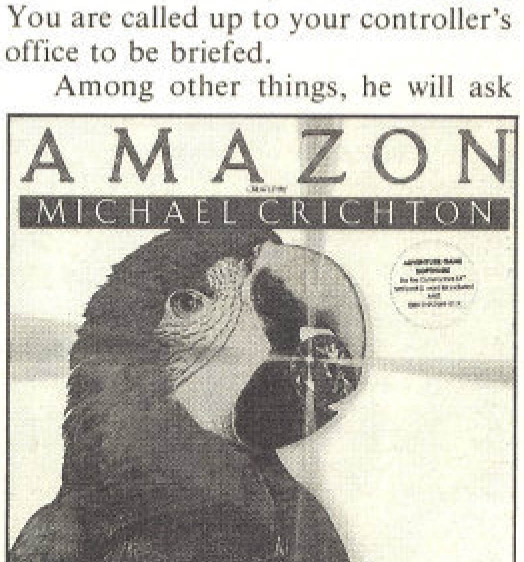
The game comes on two disks – both double sided – so expect a lengthy operation. Unlike many conventional adventure games, *Amazon* does not require extensive mapping to ensure you know where you are. It is very much like a paperback novel, you start at the beginning and work your way through page by page to the end.

The game revolves around puzzles that have to be answered before any further progress can be made. There are a few 'side roads', but you are invariably forced back to the 'main road' to continue to the next puzzle. There are several pages of instructions and background information, including a map, a list of words understood by the parser and a coded help sheet.

Playing the game occasions extensive use of the disk drive, with many inputs causing it to whirr away for seconds at a time. Although the disk access is not particularly slow, this enforced waiting can become a bit of a bore at times. At the beginning of the game you are reminded to create a 'save disk', on which you can save up to 10 game positions – do this at the earliest opportunity!

The introductory sequence takes six minutes and is interesting the first time round but you will not want to wait through this each time you 'die' or make a silly mistake! Things start in the NSRT control room where a video link reveals the expedition's demise. You are called up to your controller's office to be briefed.

Among other things, he will ask



you to spell out your name. Take care, later in the game you may be asked your name – mispell it, even by substituting lower case letters for for upper case, and you will be accused as an imposter and will have to start again!

As soon as you leave his office, make your first game save. From then on it's up to you, but this save will eliminate those initial six plus minutes. You will be given some extra equipment before you board a plane at the start of your assignment, check the contents carefully.

Your first task is to pick up some helpful information from a Professor Beneker in Miami, unfortunately he is killed before you can talk to him. Nevertheless, you do get some help in the form of Paco, the Professor's parrot. This talkative creature is a fund of knowledge and can often give you a clue when you are in a tight spot!

In due course you are parachuted into the American jungle and have to report back to NSRT via your computer/transmitter. This item enables headquarters to keep track of your location and on several occasions they will guide you out of trouble by giving you map references to aim for.

Switching on your computer changes the normal graphics picture of where you are, to what is presumably the computer's display. You must enter your security code before NSRT will complete the connection, you made a note of this didn't you! Having completed transmission, the computer display clears – taking 30 seconds to do so, ouch!

At one point you have to locate a roving band of monkeys who have stolen your backpack. Use of a joystick is recommended but this seems a little out of context and is

more of a nuisance than a challenge.

Altogether this game is an interesting attempt at trying to create something a little out of the ordinary. The basic story line is good, with reasonable graphics – which may be switched off to speed the game up – and the game could well be recommended to beginners but might prove too slow and predictable for the more experienced adventurer.

Red What?

Melbourne House's latest adventure, *Redhawk*, is a game with a difference. The graphics are in the form of a scrolling comic strip, which makes sense, as the game is about Redhawk, a comic type super-hero.

At the start of the game, Kevin Oliver, the normal human side of Redhawk, finds himself in hospital suffering from amnesia. Whether or not he had some previous existence we are not to know but now he is searching for a job as a crime photographer. Having got him settled in his new job you may aim him into whatever adventures come along.

Having lost any previous memories, you hve the choice of making him act as either super-hero *or* super-villain. Redhawk's popularity rating, shown graphically beneath the comic strip, will affect the interaction of the other characters. To find out what the heck is going on, it seems best to choose here rather than villain.

SAY (or SHOUT) "KWAH" (with quotes), and our Kev will change into the fearless Redhawk. He is able to fly and has most of the powers claimed for super-heroes. The main snag is that as Redhawk, his energy output is high and his reservoirs of power fairly low! So a return to being plain Kevin is very necessary after only a few minutes.

Location descriptions are almost non-existent as they are all included within the 'comic strip' shown at the top of the screen. This strip has three frames that scroll across the screen from right to left at each command. You would think that this would show the present and two previous scenes but this is not so.

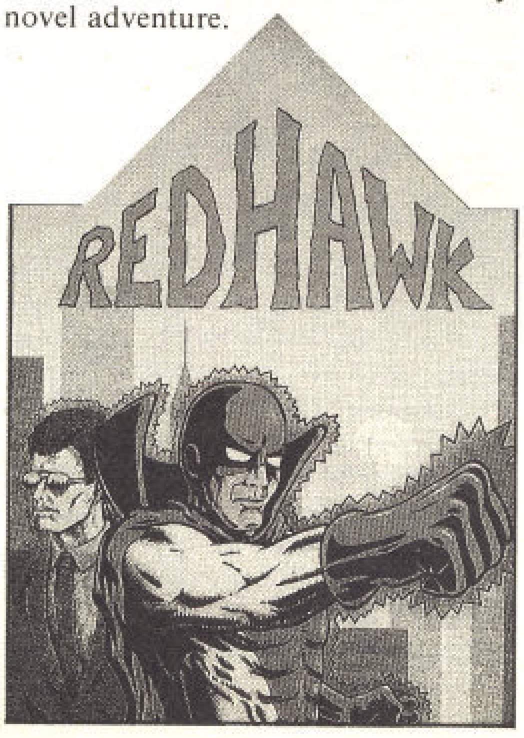
Each command, if understood, is repeated by the Kevin in the strip and only then actioned – two frames for one command. This would not be so bad if the frames were drawn quickily but they are not. this is quite painful if all you want to do is go from location A to location B, it is even worse having to wait for the frame to be drawn to be told: "Kevin looks for a way north but can't find one!"

The game is played in real time with a digital clock ticking away the seconds as you wonder what to do next. Fortunately the clock is stopped if Kevin does not understand what you are trying to get him to do. Unfortunately this seems to happen all too often, his knowledge of normal 'adventure talk' is sadly lacking.

His inability to understand the command OPEN DOOR brought up the response: "open" confuses Kevin. He does seem to be a very confused young man. Another change from normal practice is the use of EXAMINE. Here it literally means a body search, perhaps it was not surprising that a young lady I met early in the game, objected quite strongly when I told Kevin to examine her!

For all its differences to normal 'adventure speak', Kevin will understand fairly complex sentences with multiple commands separated by commas also accepted. A number of common commands are shown at the bottom of the screen and are accessed by CTRL and one of the number keys. The game has a STORE facility (a version of RAMSAVE) with a normal tape save/load to cassette for saving your position between games.

Overall 'Redhawk' was rather disappointing and boringly slow when you consider the lack of text and rather repetitive graphics. The game puzzles are good with the feeling that something startling is just around the corner but the lack of any real atmosphere destroys what could have been a really novel adventure.



The French connection

Infrogames is a new name in this country, and it looks as though it may be heard of a great deal more in the future. The first offering is an adventure, *Mandragore*. This is best compared with *Exodus Ultima III*, with a band of intrepid adventurers exploring a strange land and the castles and villages they find in their travels.

This French variant comes with a fairly long background story to set the scene for the adventure. The good and just King Jorian has been killed in suspicious circumstances and his lands taken over by the evil Yarod-Nor. It is the task of would-be adventurers to search out and find the means by which to overthrow this reign of evil.

Mandragore is on two cassettes or one disk and is pretty large, with only 37 blocks unused on the disk. A further formatted disk or blank tape is required if you wish to save your party's progress for use on your next visit.

On loading the game you are given the choice of starting from scratch and forming a party of your own choice, continuing with a previous adventure or using a ready formed party under the leadership of a female Paladin, Syrella.

If you are new to the game it is probably wise to use the ready formed party. This will enable you to get some idea of what the game is about, how it works and also which characters are best at what! Initially death comes quickly and your first explorations will be over quite rapidly, but hopefully you will have learnt something useful before all four characters have keeled over.

If you choose to start with your own party, you must first create the four characters who will make up the group. For each member you have to apportion 80 points (minimum five, maximum 20) to six attributes – Constitution, Strength, Knowledge, Wisdom, Dexterity and Appearance. For Knowledge read Intelligence, for Appearance, Charm or Charisma.

You must give the characters a name (up to six letters) and define their sex. Five different races are possible – Human, Dwarf, Hobbit, Elf or Mi-Orc (Mighty Orc?) but there is no information as to the effect of this choice. There are six different character types – Warrior, Ranger, Wizard, Cleric, Thief and Minstrel. This choice is not entirely open as each of the last five

must have over 14 points given to them in their primary attribute – Ranger, Strength; Wizard, Knowledge; Cleric, Wisdom etc. Any charcter may be a Warrior (press key 'S', soldier?)

Your final choice is the character's colour, this helps differentiate characters of the same type when they are shown graphically during the adventure. Once a team has been created – save it to disk or tape. Creating a team is not a long process but it is certainly not something you will want to repeat if someone dies in the first few minutes of play!

You start in the wilds, north west of a village and west of one of the Chateaux (its a French game, remember!). Your team is depicted by a single figure that may be moved around the scrolling countryside with direction keys N, E, S, W. There are various terrains to be explored – plains, forests, hills and swamps, all of which are passable. There are also areas of water where you will need a boat to get across and finaly mountains that are impassable.

There are a number of villages where you can buy or steal items that you may need, all villages appear to be the same when you get inside but that does not make them any the less welcome. There are 10 chateaux, one of which contains the evil Yarod-Nor but the other nine must be visited and their puzzles solved to help you complete your quest.

On entering either villages or chateaux, the display changes from a general plan view to a limited 3D picture. This shows you that location, the members of your party and any objects or creatures present. To the right of this picture is a brief status of your characters, their experience and life points. Also shown is a list of visible objects or creatures. A maximum of four things can be seen at any location with each being coded A-D.

The function keys F1-F4 will display a full status report on each of your four characters, including any artefacts, food or money held by them. Each character may only carry four objects and the full status report will give each of these a number (1-4). You must remember which number refers to what, as *Mandragore* has a novel input routine that requires the player to type in commands in a highly abbreviated form.

Each character has a number (1.4) and the 29 verbs that are understood are recognised by either one or two letter abbreviations. This is a little confusing at first but once mastered, enables commands to be issued very quickly. 1 BU C will diaplsy on the screen as SYRELLA BUYS MEDICINE, the medicine being object 'C' shown at that location.

Several verbs support two objects, so, 3 AT A 2 converts to TORLINN ATTACKS HARPY WITH SWORD – this is why you must remember tht in Torlinn's inventory, item '2' is a sword!

As your party moves around the 'map' of Mandragore, they will be attacked by a variety of wandering monsters. With the low experience points the characters start with, this can be fatal. Experience is gained for most successfully completed actions – disarming booby traps, opening gates, finding treasure and of course defeating the many monsters.

Damage to any member of the team either from an attacking monster or a booby trap, will cause a loss of 'life points'; zero points and that person is dead. Fortunately, in each village is a supply of very beneficial medicine – not expensive and should be taken by everyone at regular intervals! One slightly annoying point is that once a member has bought an item from a village shop – it cannot be bought again without leaving the village and re-entering. Buying stocks of medicine can take several minutes as you all trot in and out.

Life points may also be replenished by eating or drinking. Food may be bought in the villages but the command is strange – SYRELLA BARTERS 9, will get her 9 units of food for a cost of 18 units of money. In a number of locations within the chateaux you can find something to HUNT – rabbits for instance. These too can be eaten to replenish lost points!

If you have a well experienced Thief in the party you can raise your party's funds to almost any level providing you have the patience to keep popping in and out of a village stealing something and then handing it over to another member of the party to sell. This latter action is necessary, as, if caught, all objects, money, food and some life points are taken from the thief as a punishment.

Although you can TAKE many of the things you will find in the chateaux, you cannot drop them somewhere and retrieve them later – they are gone for good. Also the word 'drop' is not understood (DR is used for DRINK), you must use the unusual word LAY instead!

The characters may talk (ASK) to many of the beings they meet in the chateaux. The responses are brief and usually give some form of cryptic clue about the puzzles to come. Other commands include OPEN, BREAK, SHOOT, READ. Not all commands are successful at first, so if in doubt – try again, perhaps using a different person. '*' will usually repeat the last command and can be a boon when fighting.

Once inside a village or chateau, it is possible to split your team up and control them independently. They could then theoretically each explore a different chateau or simply different rooms in the same chateau. There did not seem to be any valid reason for them to split up – but it is an interesting option, how about a multi-player game?

There are a number of special spells available to Wizards – LOOK, TELEPORT, SPELL, PARALYSE, HYPNOTISE and PETRIFY. I did not find these particularly vital and as they all use up some of the user's life points, I used them very infrequently. There may be special need for one or more of these commands, but if so I have not yet found it!

The pictures are fairly chunky block graphics that draw very quickly and although simplistic in outline, set the scene well for what is after all a fighting adventure with added puzzles. The puzzles are far from clear so do not expect to solve this game at one, two or three sittings. Many of the chateaux have creatures that MUST be fought before you can get to all the rooms. The diversity of these creatures is quite amazing, I do not think that I have ever come across a game with so many different monsters!

Do NOT type in HELP, this merely takes you back to the initial menu – if you have saved your game position, then you can return to that point otherwise you will have to start again!

An interesting game with a lot more to it than first meets the eye, not in the same league as *Ultima III* or *Ultima IV* but nevertheless a good challenge, with some of the good points associated with role playing adventures in the 'D and D' tradition.

Your key to communications!

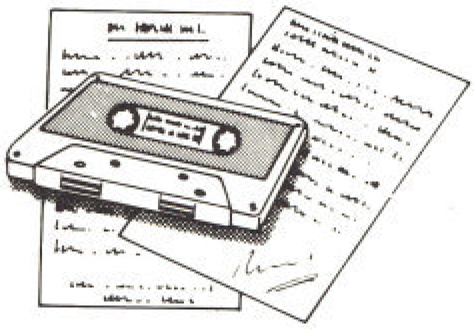
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GAME OF THE MONTH

Sentinel

Can you escape the Sentinel's gaze? Firebird challenges you to try with a mind twisting game of hide and seek.

By Eric Doyle

Sentinel is an oasis in a desert and every bit as refreshing. In a world where clone programs permeate the software industry it is a great relief that someone, somewhere can come up with a fresh idea.

The Sentinel is an evil despot who has conquered 10,000 worlds but there comes a time when the worm turns. In this case the 'worm' takes the form of a synthoid robot with a novel mode of travelling.

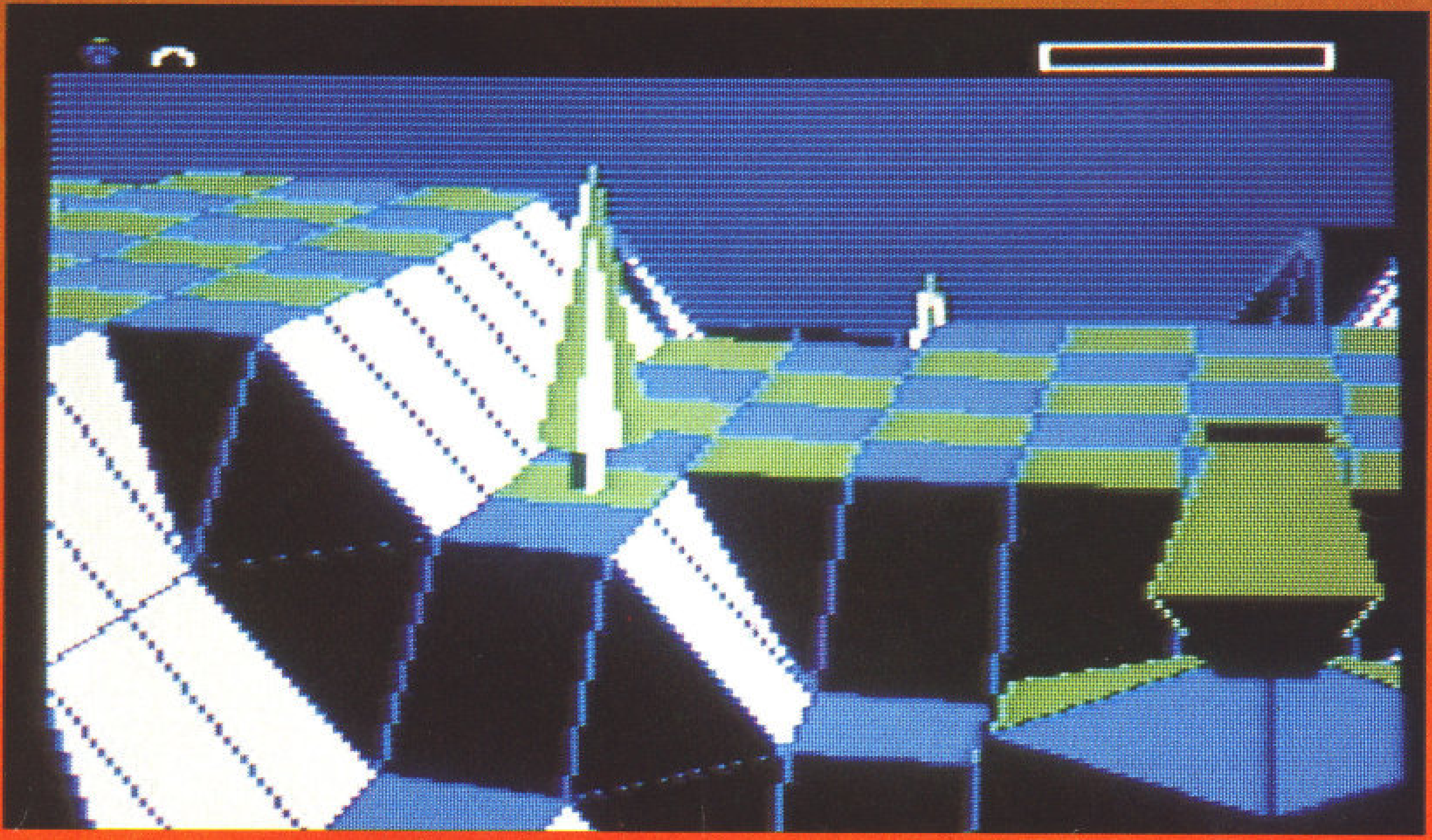
The robot projects an empty shell to the next place it wishes to occupy and then teleports itself into its new position. To conserve energy the synthoid can then re-absorb the old shell which allows another shell to be produced further along its route.

The Sentinel's planets have deep valleys cutting their way through mountainous terrain, all displayed in tremendous 3D. Normally the Sentinel occupies the highest point on the landscape. Every few seconds the Sentinel will rotate to face a new direction as it searches for a sign of the synthoid. A full rotation takes 12 such moves and woe betide the synthoid who falls under the Sentinel's gaze.

Meanwhile, down in the valleys the synthoid seems to have a problem. A new shell can only be projected if the



robot can see the surface which it will be placed on. To raise its position the synthoid can create a boulder, or a stack of boulders, and then place the shell on top. This enables the robot to climb out of the deepest of gullies in its search for the Sentinel.



Should the Sentinel spot the synthoid as it travels about the land, the synthoid will detect the scan which precedes a fatal draining of its energy. At this point evasive action should be taken as quickly as possible by throwing out another shell. The old shell will have to be absorbed as soon as possible because the Sentinel will continue to draw its energy away and the shell will gradually change as it loses power. First it becomes a boulder and then it becomes a tree before finally disappearing altogether.

This shows the different energy levels. The basic currency is the tree. Two trees make a boulder, a boulder plus a tree makes a shell. As the robot moves around it will find more trees on the landscape to replenish any energy stolen by the Sentinel.

The principal rule is that energy can only be drained from an object if its base can be seen by the robot. Anything on a higher level cannot be assimilated. For the Sentinel on its high plane this is rarely a problem but the synthoid has to use its boulders to reach the trees on higher levels.

If the Sentinel can see its enemy but cannot see its base, the synthoid's scan registers a half dosage. Although the synthoid is safe for the moment, the Sentinel will metamorphise a nearby tree into a 'meanie'. This will scan around at a faster rate than its creator and, if it sees the synthoid, it will hyperspace its foe to another part of the planet.

Hyperspacing, whether forced or deliberate, takes the same amount of energy as producing a shell (three trees). If the energy reserve is insufficient, the synthoid will be destroyed.

The eventual aim of the synthoid is to create a boulder platform which will raise it above the Sentinel so that its vulnerable base is revealed and the hunter becomes the hunted. Once the Sentinel has been drained of energy, a hyperspace jump will reveal the secret code which will allow access to one of the other 10,000 planets.

As the levels increase the game becomes more and more complex. The Sentinel is joined by an increasing number of Sentries who behave exactly as their controller but from less exalted heights. Before the Sentinel can be attacked in a final assault, all the Sentries must be wiped out. This really puts the pigeon amongst the cats!

Combining so many skills, the game has everything going for it. The graphics are cleverly conceived, at times the gameplay is as fast as any arcade shoot-'em-up and yet the strategy element requires as much concentration as Chess. Sentinel deserves to be as big a hit as Firebird's classic Elite and in a similar way compresses a complex and sophisticated graphic style in a single load game.

Sentinel is a truly unique game and it deserves the accolade of being an essential addition to all C64 owners' collections. YC

Touchline
Name; Sentinel ***Price:*** *£9.95* ***Machine:*** *C64* ***Supplier:*** *Firebird*
Originality: *10/10*
Graphics: *9/10.*
Playability: *9/10.*
Value: *10/10.*


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Select Menu 128

Keep track of everything that's on your disks easily and simply with our menu program.

By M.E. Catley

Select Menu 128 is a utility program written for the C128 plus 1541 or 1571 disk drive. Written entirely in machine code, the program loads as a Basic program. Once the listing has been typed in, ensure it has been saved prior to running as it will overwrite itself, and recovery from an error is not possible.

The program will write a menu on your disk which will display all or any program files on the disk selected by you, each of which can be selected and run by pressing just one key. When run you will be requested to insert the disk to receive the menu into the drive and press any key. The name of each program file on the disk will then be displayed in turn with and INCLUDE/IN message. To include this program in the menu press Y, otherwise press N. When the final file has been displayed, the menu itself will be saved to disk, overwriting any other menu program on the disk. It will also be run at the same time, so any file can then be loaded by just pressing the number or letter prior to the name.

If the program is run on a disk immediately after formatting, a file called menu will be saved as the first file in the directory, and can subsequently be loaded by pressing SHIFT/RUN STOP. This program can then be re-run as often as required as and when new program files are saved on to the disk.

PROGRAM: SEL MENU.DATA

```
 7149DATA 1C01
 7169DATA 0B,1C,0A,00,9E,38,34,3
4,38,00,00,00,A0,00,20,CF,1C,A9,
6B,85,04E8
 7189DATA FB,A9,1D,85,FC,20,D9,1
C,18,A2,18,A0,06,20,F0,FF,A0,00,
84,FB,09FD
 7209DATA A9,1D,85,FC,20,D9,1C,2
0,E4,FF,C9,20,D0,03,4C,C2,1C,C9,
30,90,09CE
 7229DATA F2,C9,5B,B0,EE,C9,3A,9
0,04,C9,41,90,E6,38,E9,30,C9,0A,
90,02,0AB1
 7249DATA E9,07,CD,FF,1C,B0,D8,A
8,B9,20,1D,85,FC,B9,44,1D,85,FB,
A0,0F,0AC8
 7269DATA B1,FB,99,EF,1C,88,10,F
8,A0,0F,B9,EF,1C,C9,20,F0,04,C9,
A0,D0,0869
 7289DATA 03,88,D0,F2,C8,84,FD,C
0,00,F0,AC,20,7B,C0,A9,01,85,B9,
A5,FD,0BD7
 7309DATA A2,EF,A0,1C,20,BD,FF,A
9,00,85,0C,A0,04,B9,E9,1C,99,4A,
03,88,0933
 7329DATA 10,F7,A9,05,85,D0,A0,0
4,B9,BD,1C,99,00,02,88,10,F7,A2,
1C,86,08AE
 7349DATA 2E,A0,01,84,20,4C,00,0
2,A9,00,4C,D5,FF,EA,A9,93,20,D2,
FF,A9,0957
 7369DATA 9E,20,D2,FF,A0,00,8C,2
0,D0,8C,21,D0,8C,15,D0,60,B1,FB,
F0,0B,0AA0
 7389DATA 20,D2,FF,E6,FB,D0,F5,E
6,FC,D0,F1,60,93,52,55,4E,0D,00,
00,00,082F
 7409DATA 00,00,00,00,00,00,00,0
0,00,00,00,00,00,00,00,12,96,20,
20,20,0108
 7429DATA 2A,2A,2A,20,53,50,41,4
3,45,20,54,4F,20,45,58,49,54,20,
2A,2A,049B
 7449DATA 2A,20,20,20,90,13,00,1
D,1E,1E,1E,1E,1E,1E,1F,1F,1F,1F,
1F,1F,02B8
 7469DATA 1F,20,20,20,20,1D,1E,1
E,1E,1E,1E,1E,1E,1F,1F,1F,1F,1F,1F,
20,20,026A
 7489DATA 20,20,20,EC,14,3C,64,8
C,B4,DC,04,2C,54,7C,A4,CC,F4,1C,
44,6C,084C
 7509DATA 94,FF,27,4F,77,9F,C7,E
F,17,3F,67,8F,B7,DF,07,2F,57,7F,
A7,08,0972
 7529DATA 8E,9E,93,0D,20,4D,45,4
E;55,20,46,4F,52,20,44,49,53,4B,
20,20,0583
 7549DATA 20,96,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,02F6
 7569DATA 20,20,20,20,20,99,0D,2
0,12,28,43,29,20,31,39,38,36,20,
4D,2E,039F
 7589DATA 20,43,41,54,4C,45,59,2
E,20,52,49,43,48,4D,4F,4E,44,2E,
20,4E,0520
 7609DATA 2E,59,4F,52,48,53,2E,9
2,9E,20,20,20,20,20,20,20,20,20,
20,20,0484
 7629DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7649DATA 20,20,20,20,20,20,9E,0
D,20,30,20,4D,45,4E,55,20,20,20,
20,20,0380
 7669DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7689DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
```

```
20,20,024D
 7709DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7729DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7749DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7769DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7789DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7809DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7829DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7849DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7869DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7889DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7909DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7929DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7949DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 7969DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 7989DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8009DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8029DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8049DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8069DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8089DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8109DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8129DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8149DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8169DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8189DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8209DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8229DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8249DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8269DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8289DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8309DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8329DATA 20,20,20,20,20,20,20,0
D,20,00,20,20,20,20,20,20,20,20,
20,20,024D
 8349DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 8369DATA 20,20,20,20,20,20,20,0
0,00,00,00,00,00,00,00,00,00,00,
00,00,00E0
 8389DATA 00,00,00,00,00,00,00,0
0,00,00,00,00,00,00,00,00,00,00,
00,00,0000
 8409DATA 00,00,00,00,00,00,00,0
0,00,00,00,00,00,00,00,8E,FF,1C,
E0,12,029B
 8429DATA B0,10,BD,44,1D,69,28,8
D,D3,21,BD,20,1D,69,00,8D,D5,21,
60,A0,07D6
 8449DATA 00,20,CF,1C,EA,84,FD,A
9,30,85,FE,A9,58,85,FB,A9,23,85,
FC,20,0AC0
 8469DATA D9,1C,20,E4,FF,C9,00,F
0,F9,A9,0F,A2,08,A0,0F,20,BA,FF,
A9,08,0A45
 8489DATA A2,4C,A0,23,20,BD,FF,2
0,C0,FF,20,CC,FF,A9,0F,20,C3,FF,
A0,03,0A94
 8509DATA B9,34,23,99,06,1C,88,1
0,F7,A9,01,A2,08,A0,00,20,BA,FF,
A9,04,07D4
 8529DATA A2,54,A0,23,20,BD,FF,2
0,C0,FF,A2,01,20,C6,FF,20,46,22,
20,B7,095B
 8549DATA FF,C9,00,D0,41,A0,00,B
9,08,26,99,86,1D,C8,C0,10,D0,F5,
AD,1A,09C0
 8569DATA 26,8D,81,1D,AD,1B,26,8
D,82,1D,A2,01,20,46,22,20,B7,FF,
C9,00,0735
 8589DATA D0,1C,A0,00,B9,48,23,D
9,19,26,D0,EC,C8,C0,04,D0,F3,20,
EC,21,0A00
 8609DATA B0,E2,20,2C,22,E8,A9,0
5,D0,DA,20,CC,FF,A9,01,20,C3,FF,
A9,0F,0A6F
 8629DATA 20,7D,22,A9,00,A2,08,A
0,01,20,BA,FF,A9,06,A2,4D,A0,23,
20,BD,07CA
 8649DATA FF,A9,01,85,2D,A9,1C,8
5,2E,A2,00,A0,00,A9,2D,20,D8,FF,
4C,0D,083B
 8669DATA 1C,A0,00,20,CF,FF,99,0
0,26,C8,C0,20,D0,F5,60,A0,10,B9,
08,26,08CD
 8689DATA C9,22,F0,05,88,D0,F6,3
8,60,A9,20,99,08,26,AD,15,26,C9,
50,F0,0947
 8709DATA 13,A0,00,B9,08,26,D9,3
8,23,D0,07,C8,C0,10,D0,F3,38,60,
18,60,0810
 8729DATA AD,16,26,C9,52,F0,06,C
9,47,D0,E2,F0,EF,AD,17,26,4C,20,
22,86,0999
 8749DATA AE,A0,00,B9,08,26,91,F
D,C8,C0,10,D0,F6,18,A5,FD,69,10,
85,FD,0AD6
 8769DATA 90,02,E6,FE,60,20,DE,2
1,A0,00,B9,00,26,C9,22,F0,06,C8,
C0,20,08FD
 8789DATA D0,F4,60,C0,07,F0,FB,8
C,6C,24,A0,1F,B9,FF,25,99,00,26,
88,CC,0AA1
 8809DATA 6C,24,D0,F4,A9,20,AC,6
C,24,99,00,26,A9,00,8D,1F,26,4C,
49,22,074A
 8829DATA 20,C3,FF,A9,01,85,AC,A
9,F0,85,AE,A9,2F,85,AF,A0,00,B9,
07,24,0A19
 8849DATA F0,06,20,D2,FF,C8,D0,F
5,18,A5,AE,69,10,85,AE,90,02,E6,
AF,A5,0B57
 8869DATA FD,C5,AE,D0,07,A5,FE,C
5,AF,D0,01,60,A0,00,B9,5C,24,F0,
06,20,0A7E
 8889DATA D2,FF,C8,D0,F5,A0,00,B
1,AE,20,D2,FF,C8,C0,10,D0,F6,20,
E4,FF,0DAF
 8909DATA F0,FB,C9,4E,F0,C6,C9,5
9,D0,F3,A6,AC,BD,20,1D,85,FC,BD,
44,1D,0C88
 8929DATA 38,E9,02,B0,02,C6,FC,8
5,FB,BD,10,23,A0,00,91,FB,18,A9,
02,65,095B
 8949DATA FB,85,FB,90,02,E6,FC,B
1,AE,91,FB,C8,C0,10,D0,F7,E8,86,
AC,20,0D73
 8969DATA E8,20,E0,24,D0,8A,60,3
0,31,32,33,34,35,36,37,38,39,41,
42,43,0699
 8989DATA 44,45,46,47,48,49,4A,4
B,4C,4D,4E,4F,50,51,52,53,54,55,
56,57,060E
 9009DATA 58,59,5A,37,31,38,31,4
D,45,4E,55,20,20,20,20,20,20,20,
20,20,0431
 9029DATA 20,20,20,20,50,52,47,5
3,30,3A,4D,45,4E,55,0D,24,30,3A,
2A,93,04B3
 9049DATA 08,8E,96,12,20,20,20,2
0,20,20,20,20,20,20,53,45,4C,45,
43,54,043E
 9069DATA 49,56,45,20,4D,45,4E,5
5,20,4D,41,4B,45,52,12,96,20,20,
20,20,04F1
 9089DATA 20,20,20,20,20,20,28,4
3,29,20,31,39,38,36,20,20,4D,2E,
20,43,036A
 9109DATA 41,54,4C,45,59,2E,20,2
0,52,49,43,48,4D,4F,4E,44,2E,20,
4E,2E,050B
 9129DATA 59,4F,52,4B,53,2E,0D,0
D,0D,0D,0D,0D,0D,0D,0D,0D,0D,0D,
0D,9E,030D
 9149DATA 20,20,20,20,20,20,20,2
0,20,50,4C,41,43,45,20,20,44,49,
53,4B,03F0
 9169DATA 20,20,49,4E,20,20,44,5
2,49,56,45,20,20,20,20,20,20,20,
0D,0D,038B
 9189DATA 0D,0D,20,20,20,20,20,2
0,20,20,20,50,52,45,53,53,20,41,
4E,59,03CF
 9209DATA 20,4B,45,59,20,54,4F,2
0,53,54,41,52,54,00,0D,91,8E,20,
20,20,0506
 9229DATA 20,20,20,20,20,20,20,2
0,20,49,4E,43,4C,55,44,45,20,59,
2F,4E,041A
 9249DATA 20,20,20,20,20,20,20,2
0,0D,91,91,91,91,91,20,20,20,20,
20,20,04A2
 9269DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
20,20,0280
 9289DATA 20,20,20,20,20,20,20,2
0,20,20,20,20,20,20,20,20,20,20,
00,0D,024D
 9309DATA 8E,91,20,20,20,20,20,2
0,20,20,20,20,20,20,00,00,00,00,
00,00,029F
 9329DATA END
 63995PRINT"[CLEAR]":COLOR0,1:CO
LOR4,1:CHAR1,10,12,"[YELLOW]WORK
ING....$",1:CHAR1,14,14,"PLEASE[
SPC2]WAIT",1:RESTORE
 63996READA$:S=DEC(A$):E=S:DO:RE
ADB$:IFB$="END"THENEXIT
 63997SU=0:FORJ=0TO19:B=DEC(B$):
POKEE+J,B:SU=SU+B:CHAR1,22,12,HE
X$(E+J)+"=$"+B$,1
 63998READB$:NEXT:E=E+20:IFSU<>D
EC(B$)THENPRINT"[CLEAR][DOWN5][C
3]DATA ERROR IN LINE"PEEK(65)+25
6*PEEK(66):END
 63999LOOP:INPUT"[CLEAR][DOWN6]F
ILENAME OF TARGET FILE:";N$:BSAV
E(N$),B0,P(S)TOP(E):END
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Below you will find a list of guidelines that will help us to deal with any item that you send in to us. We don't expect everybody to be the next William Shakespeare but if you do follow these simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.

2) All text should be double spaced i.e. there should be a blank line between each line of text. You should also leave a margin of about 10 characters around the text.

3) On the very first page you should put the following:

Name of the article
Machine that it is for
Any extras required – disk, printer etc.
Your name
Your address
Your telephone number

4) The top of every page should have the following information on it:

Abbreviation of the article title
Your name
The page number

For example, suppose you had submitted an article on C64 interrupts. You should put something like the following at the head of the page:

Interrupts/J.Smith/1

5) Please make sure that you do not make any additional marks on your text especially underlining.

6) Try and write in clear concise English, it does not have to be a work of literature but it must be comprehensible.

7) On the bottom of each page you should put the word MORE if there are more pages to the article or ENDS if it is the last page.

8) If possible, enclose a listing of all programs.

9) Under no circumstances use a staple to hold the pages together. Use a paperclip instead.

10) Programs should be included on either disk or tape. Make sure that you SAVE two copies of every program so that we have a better chance of loading them if problems occur.

11) Programs under 10 lines can be included in the text. If your program is longer than this you must enclose a disk or cassette.

12) If your article needs any artwork then supply clear examples of what is needed. We don't expect you to be an artist but we do need to see what is required.

13) Photographs, if necessary, must be either black and white prints or colour slides. We can take shots ourselves so don't worry about this too much.

14) Submissions of any length are welcome. If you have a five line routine that you think may be of use to someone else we welcome it just as much as a full blown six part series.

15) Payment varies quite a lot and depends on quite a number of factors, such as complexity of program, presentation of program, number of magazine pages it takes up etc. Payment is generally between £10.00 and £800.00.

16) All payments are made in the month that the magazine containing your article has appeared in print.

17) If we do find your submission suitable for inclusion in the magazine we will write to you giving the terms of publication, the rate of payment and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.

18) If you want the program returning to you, should we find it unsuitable for publication, then you should enclose a stamped self addressed envelope.

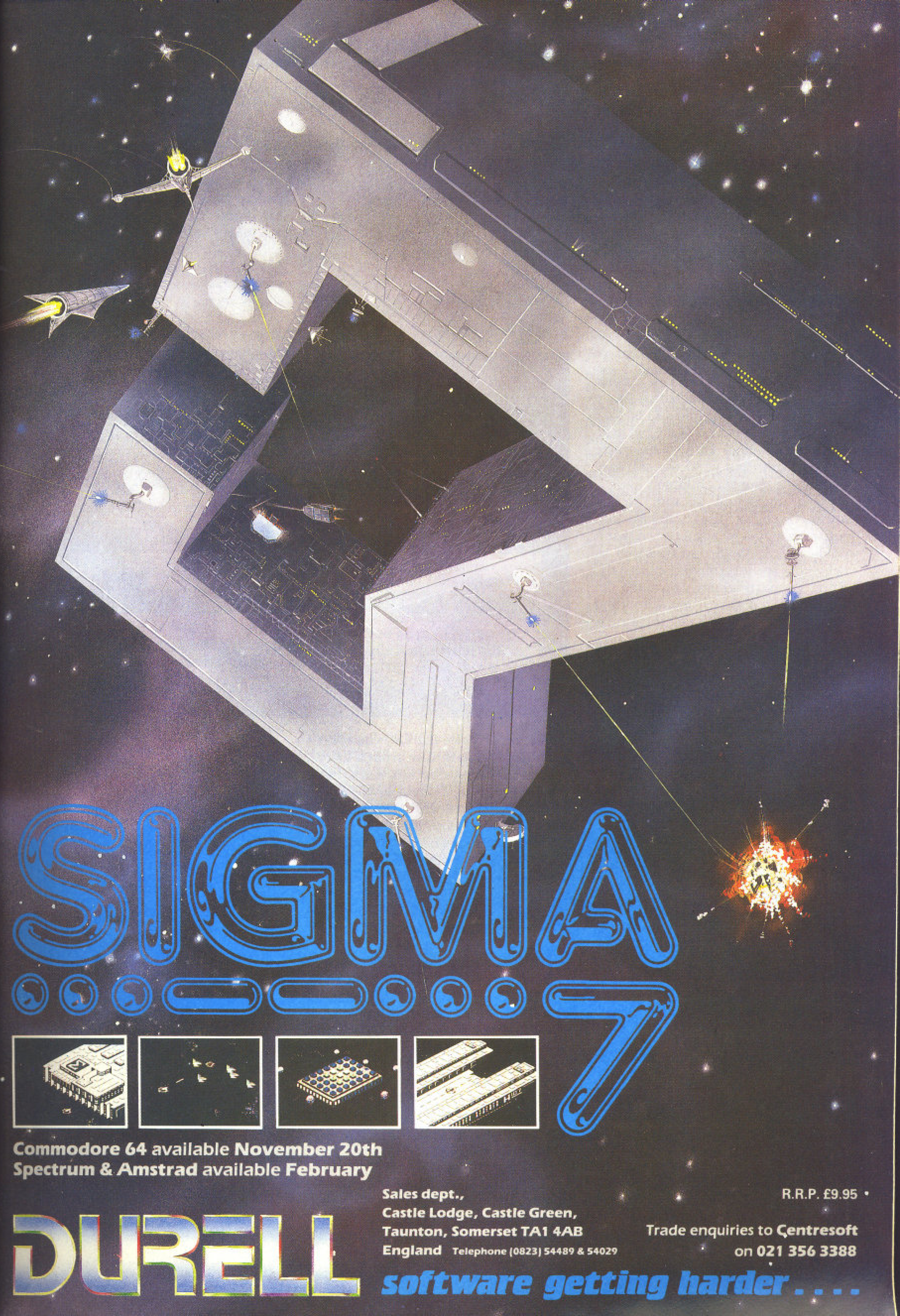
19) The last and most important point to make is 'get writing', we are waiting for your articles. YC


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Kids Stuff!

Mickey, Donald, Kermit and Gonzo all feature on US Gold's range of education games. But will you learn anything?

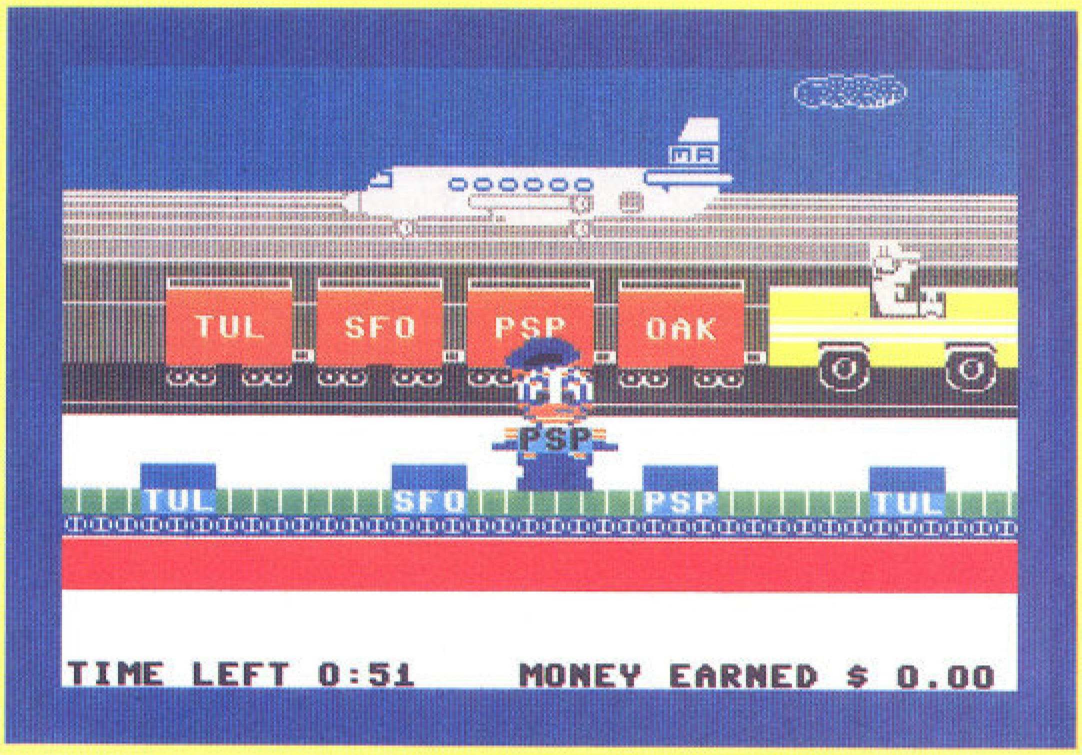
By Margaret Webb

This month's column is rather different in that it deals with a single software house – US Gold's Kids! No I don't have shares in US Gold, but in its way, this source of software has made quite a contribution to the software market for younger children.

One important feature to be appreciated is that educational software should be attractive so that it holds appeal to the user as well as delivering the information effectively. This is particularly germane to software for children in pre-school and primary age groups. Kids! software is mostly of American origin and uses Disney and other well known TV characters to help deliver its message. One drawback is that most of the packages require a disk drive in order to function. Whilst disk drives are common in the states, this is not the case over here. Their American origin does have the advantage that they have that extra bit of pazzaz that the American market demands. This also means that the graphics are to a high standard.

The first package is *Donald Duck's Playground*. This package doesn't set out to teach a particular skill but incorporates a number of features. The idea is to earn money which can be used to purchase items for the construction of an adventure playground for Donald Duck's nephews. The action centres around a street with various shops and other establishments on either sides. You control Donald and can guide him into the building of your choice.

There are four money-earning activities to choose from, each testing different skills. At the airport, your child's ability to match simple sequences of letters is tested. The idea is to pick up packages and put them in the correct trolley ready for loading on the aircraft. You are paid for each package correctly sorted and things are made slightly tougher by an in-built time built.



At the produce market, you must catch fruit being thrown from a lorry and put it in the correct box. Each time fruit is dropped, Donald gives off a string of quacked expletives in true style. In the toy store, you must collect toys and put them on the correct shelf. There is the added annoyance of frequent trains which shake toys off the shelves. Finally, you can work as controller on the Amquack railway. This involves the manipulation of points to direct the trains to the required destinations. This task is particularly tough.

Once you've amassed some money, you can go into the shops and buy ropes, ladders, wood and other junk and construct the playground. As the playground is built, you have the option of seeing the young ducks play on it.

The games cover such skills as letter recognition, matching shapes, speed of response, eye-hand co-ordination, forward planning and the handling of money during transactions. All games have three skill levels thereby catering for a wide age range.

Overall this is an attractive game which gives the impression of play rather than strict learning. Ideal for children from about six to 11.

Another play orientated package is *The Great Gonzo in Wordrider*. This is a sort of takeoff of Raiders of the Lost Ark in which the heroic Gonzo (late of the Muppets) endeavours to rescue Camilla the chicken from the evil grasp of the Swedish chef. Gonzo is equipped with a variety of exotic machines by Professor Bunsen Honeydew at the Muppet Institute of Technology. With these devices, he must negotiate a range of hazards. The child must select the machine most appropriate for the hazard. For example, a diving machine is no use in New York City and a walking machine is no good for walking over the Egglantic Ocean (note the appalling puns used in the game!). You have a choice of flying, walking, climbing, diving, gliding and rolling machines and a range of attachments such as a catcher, light maker and water squirter.

To complete the game, the child must score a specified number of

points by negotiating the various hazards. The hazards are linked so that the game is rather like a long journey or quest. The problems are two-fold.

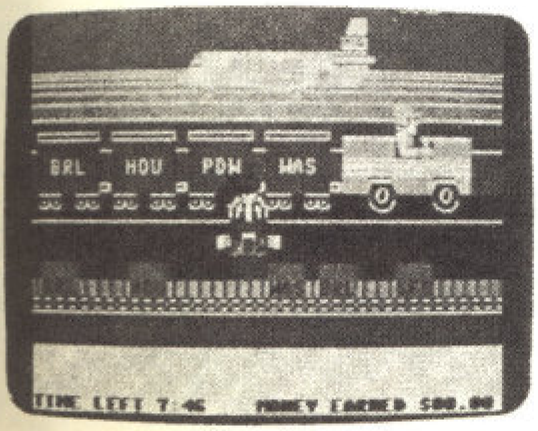
First the child must select the correct machine and attachment for the particular hazard, second, the child demonstrate the dexterity and timing needed to negotiate what are effectively a sequence of simple arcade games.

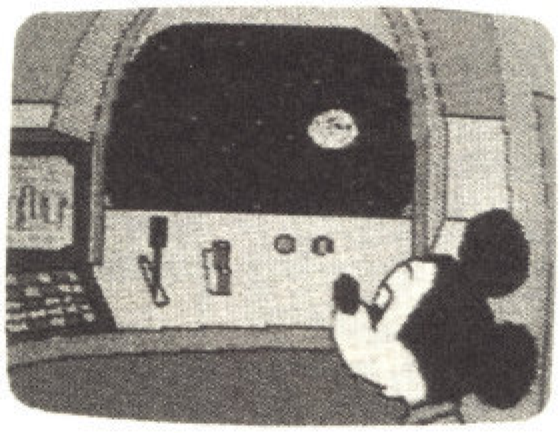
Once Camilla has been rescued, you start again but with a higher points tally to achieve. Failure means a long trek by foot across the desert.

Overall the game is ideal for the younger child (six to 11 years) with its abundance of bad puns and jokes, it's simple arcade games and the use of weird machines.

Once children start to read and recognise words, the next problem is to teach how words link together to give meaningful sentences. The problem is how to make this exercise fun. One effective approach to this problem is to get the child to write a sentence and then to read it back. *Kermit's Electronic Story Maker* providdes a cartoon based method of writing simple stories. A particularly nice touch is that the program uses a joystick to make all selections via cycling menus.

The story is built up from a series of simple sentences of about half a dozen words. The display shows the sentence at the top of the screen as a series of blanks separated by punctuation marks. You simply point at each blank and choose from the words available. Each word is accompanied by an animated sequence showing what each word represents. An example sentence would be: "While the banana dances in space, the cow barks "Yes I know it sounds silly, but the program allows unlimited variations. Once the sentence is complete, you can see the sequence described. Once satisfied, you can then move on to another sentence. The sentences have differing





structures allowing a fair degree of variety. Stories can be saved on disk for completion or replaying at a later date.

The sequences are nicely done with background music appropriate to the scene (all being based on the Muppet theme tune). The sound effects of the creatures/objects used are also sounded. Overall an excellent package which gives hours of fun.

The other two packages available are text/graphic adventures. First we have *Mickey's Space Adventure*. In this game, you assist Mickey Mouse and Pluto in their search of the solar system for a number of crystal pieces. The game is quite huge in that it occupies both sides of two disks.

In his travels, Mickey finds an alien space ship. This must be used to fly to the planets of the solar system to find the parts of the aforesaid crystal which holds the history of the alien planet. The game uses combined multicolour mode high resolution graphics with text. The pictures are true to the original Disney characters and are very colourful. The input of instructions has been simplified in that the options available are listed at the foot of the screen and you simply choose them using single key presses. The scenario is quite large with plenty of places to explore. Clues are also provided, particularly by the accompanying instructions.

On balance, the game is more suited to the older child (say nine to 12) since there is quite a lot of detailed information on the planets and other scientific topics. The accompanying literature is particularly strong with a glossary and ideas for further work. A disk drive is mandatory in order to play this game and the frequent disk changes are rather tedious. On the whole, however, this is a strong piece of software which will take quite some hours to solve. Additionally, each new game is different.

Winnie the Pooh in the Hundred Acre Wood is very similar in style to *Mickey's Space Adventure* albeit aimed at a slightly younger audience. The aim of the game is to locate objects and return them to their rightful owner. Naturally, each new game is different. To help players to play the game, a simple map is provided showing the main parts of the wood. This map bears illustrations which are similar to those shown on the screen allowing you to find out where you are. The game follows quite closely a number of events described in the original books and the illustrations are in themselves faithful to the original. As before, a simple method of selection of option is provided. There are also a number of abstract, fun options provided to allow the child to mess around. You can, for example, play Pooh sticks or look under rocks or count trees etc. There are also a number of confounding factors which can either move you to a random location or shuffle the objects around the wood. In all, just enough to keep a child quiet, or cursing (depending on your child) for hours on end. Again, unfortunately, a disk drive is needed.

So what do we have? The packages can be summarised under several features:

1) All use colourful, well designed graphics featuring well known cartoon characters. They therefore have instant appeal, particularly to the under tens. Sound is also well used to give music and effects.

2) All packages come with detailed and colourful instructions. These instructions also provide ideas for further activities and, where needed, glossaries and detailed information.

3) Except for *Donald Duck's Playground*, a disk drive is required.

4) All packages teach and test skills without making it obvious. They also achieve their goals as educational packages. In all, the Kids series is filling a large gap in the software market for the primary age group and sets standards which many domestic software houses would do well to emulate. YC

Touchline
Company: *US Gold/Kids!*
Address: *Units 2/3, Holford Way, Holford, Birmingham B6 7AX*
Tel: *021 356 3388.*

Games Reviews

Weird, wonderful, zany or just plain fun. There are hosts of games just waiting for you out there, so we've brought you some to ease the burden of your decision.

KETTLE

Kettle is Tony Crowther's second game since resuming his partnership with Alligata. The First, Trap, was featured as Game of the Month. Kettle is unfortunately somewhat disappointing.

You play the part of a kettle (surprise, surprise) and are trapped in an underground complex of 30 different levels. Your objectives are survival and escape. The key to moving from one level to the next is to find a tin opener. This is hidden deep within one of the many bowls scattered round the complex. At least I think that they are bowls. That is what they look like although the blurb insists on calling them bowels but I have a gut feeling that that is wrong somehow. Shooting the bowls 10 times results in it changing into a diamond and a further successful hit changes the diamond into an alien, a bonus, an energy giving jug of water or the much neded tin opener.

Shooting objects – bowls, bubbles and diamonds is done by use of a crizza. This orbits around your kettle and behaves something like a cross between a South American bolus and a yo-yo. You can choose from the initial option screen how you want the crizza to behave.

The most interesting part of the game is the fact that two players can play simultaneously. The screen is split so that you can watch exactly what your opponent is up to. Two distinct strategies present themselves. You can work as a partnership or you can play against eachother, waiting for the other player to do all the hard work before nipping in and stealing whatever the diamond happens to reveal.



The split screen works nicely but the main problem is that the game is just plain dull. Not one of Tony's better efforts. G.R.H.

Touchline:

Title: *Kettle.* ***Company:*** *Alligata, 1 Orange St, Sheffield.* ***Machine:*** *C64.* ***Price:*** *£9.95.* ***Originality:*** *8/10.* ***Graphics:*** *7/10.* ***Playability:*** *6/10.* ***Value:*** *5/10.*



UCHI MATA

After the plethora of karate and ninja combat games, it is a pleasure to see something a bit out of the ordinary. Such a game is Uchi Mata, a judo simulation. The name incidentally refers to one of the moves – an inner thigh throw.

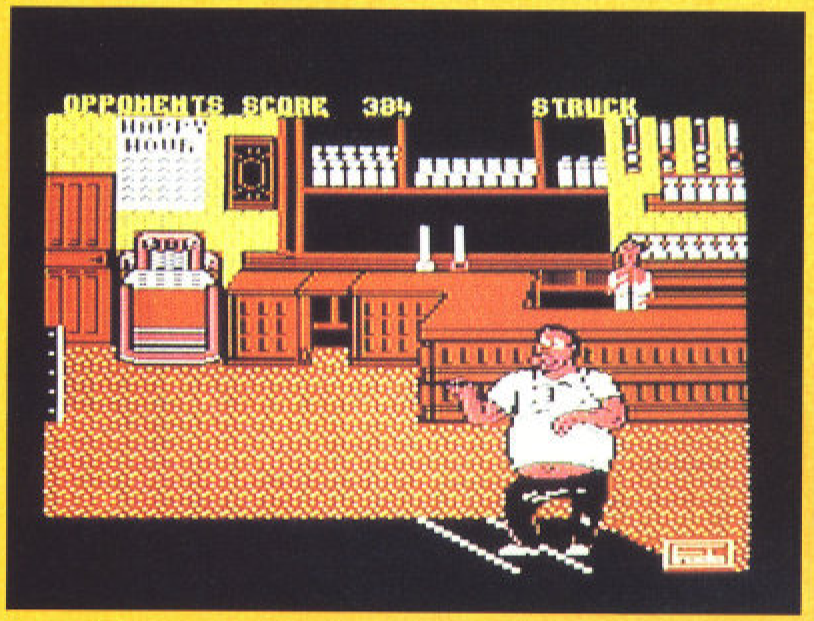
Judo allows no kicks or punches, it involves gripping your opponent's judogi, catching him off balance and trying to throw him onto his back. How well you do this results in points being awarded to you. A perfect throw is called an ippon and immediately ends the bout. Lesser manoevres may be awarded a waza-ari, yuko or koka.

Your chances of completing a successful throw depend largely on the quality of grip you have on your opponent. When you are within striking range, a quick press of the fire button makes your man make a grab and a bar chart in the top left hand corner displays the relative grips of the red and

white players together with their respective staminas. A successful throw can only be made if you are actually attacking so another press of the button lights up an indicator to denote who is the Tori (aggressor) at any given moment. The throw itself depends on a specific sequence of joystick movements. Some of these are outlined in the instructions, others you must discover for yourself. The different throws include a tomoe-nage (sacrificial stomach throw) and de ashi barai (advancing ankle sweep). There is a practise mode for you to try out these moves before you go into actual competition.

The thing that struck me most about Uchi Mata was the amount of realism that Martech have tried to include in the game. It is not as action packed as say Way of the Exploding Fist but more subtle and tactical. You really feel as if you are coming to grips with your adversary. G.R.H.

Touchline:
Title: *Uchi Mata.* ***Company:*** *Martech, Bay Terace, Pevensey Bay, E. Sussex.* ***Tel:*** *0323 768456.* ***Price*** *£7.95* ***Originality:*** *9/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*



180

As might be surmised from this game's title, 180 is a darts simulation. And it's not a bad one either. The object of the game is to win the championship. There are eight contenders, rejoicing in names such as Belly Bill, Sure Shot Sidney and Limp Wrist Larry. You can meet any of the players as you progress from the quarter finals but the final is always against Jammy Jim.

The match itself is the familiar 501, straight in, double out, a match being the best of three sets. When it is your turn to throw, a hand appears in front of the screen. It moves about slightly as you aim, so that you can't move directly to the treble twenty all the time. To further complicate matters, only the diagonal movements of the joystick are effective. The result of all this is that scoring the magic 180 is not quite as easy as it appears when the experts do it on the box. Every time you throw a dart, your current score is chalked up on the blackboard. Then you must sit back and watch your opponent throw. Each of the competitors has his own preferences and quirks but it is up to you to work out what they are.

The game is full of nice additional touches. You can practise before the match in a game of round the clock. The numbers 1 – 20 must be hit in turn within a certain time limit. There are some animated back drops as your opponent throws and should you have difficulty working out exactly which numbers you have to hit in order to finish, there is a list of the more popular combinations on the cassette insert.

Most of the attempts at darts games released so far have been fairly poor and 180 is certainly the pick of the bunch for whiling those long hours when the pub is closed. G.R.H.

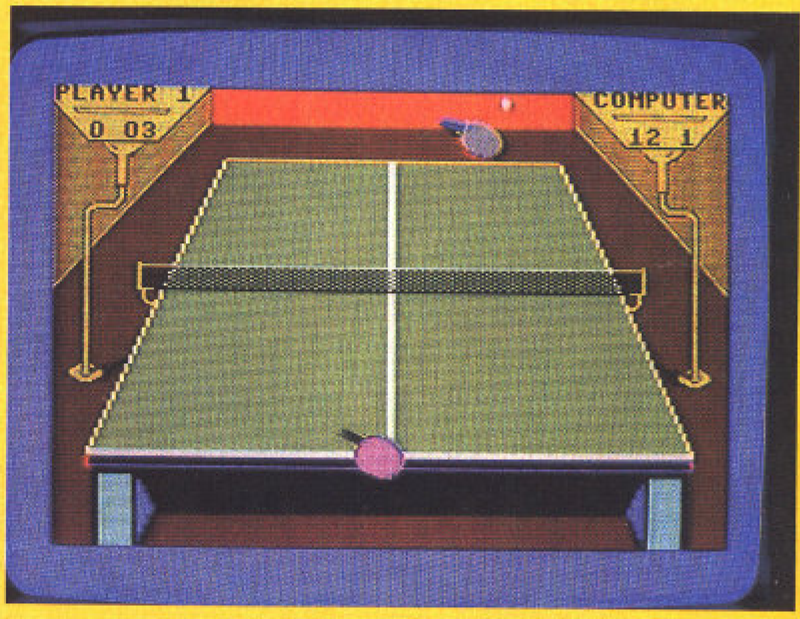
Touchline:
Title: *180.* ***Company:*** *Mastertronic, 8-10 Paul St, London EC2A 4JH.* ***Tel:*** *01 377 6880.* ***Price*** *£2.99.* ***Machine:*** *C64.* ***Originality:*** *4/10.* ***Graphics:*** *7/10.* ***Playability:*** *8/10.* ***Value:*** *7/10.*

SUPERSTAR PING PONG

Superstar Ping Pong is a table tennis simulation with enough options to provide a challenge for even the most demanding players. The bats are suspended in mid air and wave vaguely in the direction of the ball every time the fire button is pressed. Sounds too easy? That's what I thought until I lost the first two games 21-1 and 21-2 on the slowest possible settings!

Timing is crucial if you are to succeed in returning the ball over the net. Assuming that you actually make contact in the first place, the ball can leave the bat at any one of fifteen different angles. Initially, it seems that there is only one angle – one that sends the ball miles off the side of the table. The knack is to get the bat in position early rather than late. Once you get used to returning the ball, then you can start to worry about where on the table you want to put it. Your normal shot is top spin but you can smash or slice the ball if you want to.

Before you even start to play, there are three pages of options for you to select from. You can play either against the computer or a human opponent. If you choose the latter option, you can elect to view the table from side on instead of the more normal end on position. There are three speeds which equate to different skill levels and you can also opt to let the computer move the bat for you – very useful when you first start.



The standard of your game is measured over six different abilities ranging from forehand and backhand skills to speed and endurance and these can be adapted to suit your individual preferences. Finally come choices about the length of the match and bat colours.

Once you get used to controlling the bat, Superstar Ping Pong is a very realistic simulation. The number of options mean that you can always set up a situation whereby the computer is just that little bit stronger than you are. There are also some nice little touches. It is very reassuring to know that the computer is capable of mistakes as well as you and is just as likely to serve the ball straight into the net. Well worth considering if you enjoy reaction games and want to get away from shoot-em-ups for a bit. **G.R.J.**

Touchline:
Title: *Superstar Ping Pong.* ***Company:*** *US Gold, Units 2/3, Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.* ***Price:*** *£9.99 cassette, £14.99 disk.* ***Originality:*** *6/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*



SANXION

Pete Pilot here. Just taking a break from training exercises to let you know that it looks as if we're getting these aliens under control. What do you mean you don't know what I'm talking about? Look, you know we almost had a nuclear war a couple of weeks ago? You know it was only averted by the fact that the aliens turned up, determined to wipe us out because they thing we're too belligerent to inherit the Universe? Well, now they're training young guys like me to sort out the little blighters.

There's wave after wave of them, all different shapes and sizes and they are totally suicidal, man, you just have to keep on firing at them. Its not too bad at first but when they get to know yu're a firce ti be reckoned with, they send in the big guns. Weird shaped craft which spin around and fairly make you dizzy.

Seeing the world from my ship is a pretty unbelievable experience, too. Surreal silver landsapes, dark craggy scenery and mile upon mile of virgin forest. And, wow, some of the cities are realy high tech. They've got defences which are hell to penetrate. And have you ever flown through a rainbow? That's an experience not to be missed.

They're looking for thousands of trainee pilots to combat the millions of aliens now swarming the planet. Why don't you sign up, you'll never get another chance like it? Fantastic. **M.C.**

Touchline:
Title: *Sanxion.* ***Company:*** *Thalamus.*
Price: *£8.95.* ***Machine:*** *C64.* ***Originality:*** *7/10.* ***Graphics:*** *9/10.* ***Playability:*** *10/10.* ***Value:*** *8/10.*

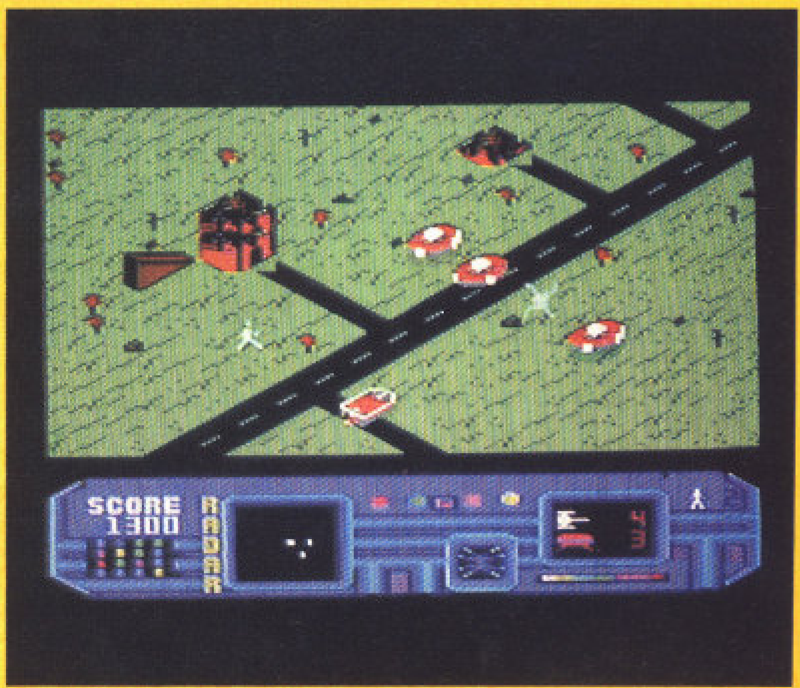
PANTHER

The city of Xenon is under attack from the usual hordes of alien invaders. You are the last remaining pilot in the Federal force and are trying to rescue the few survivors and stragglers still left in the city. The fact that the enemy now occupy large chunks of the city and will come at you with everything that they have got, should prove to be only a minor hindrance.

The game is a diagonally scrolling shoot-em-up, reminiscent of Zaxxon and Blue Max. Your Panther ship can move left and right, up and down as you fly over the landscape. Starting in the desert, you must fly over a large lake before reaching the city itself and spaceport beyond. The survivors are hiding in bunkers and oil rigs etc and you must land safely in order to pick them up. As you are constantly under attack from different waves of aliens, the chances are that you will have to make several runs through the area – a transmat at the sapceport will return you to the appropriate position. As you near the city, so the enemy radar will lock on to you unless you can fly at a very low level dodging buildings as you go.

Panther is not a bad little game, especially at the price. The control required to handle your craft should give even the most ardent arcade fan a good run for his money.

Touchline:
Title: *Panther.* ***Company:*** *Mastertronic 8-10 Paul St, London EC2A 4JH.* ***Tel:*** *01 377 6880.* ***Machine:*** *C64.* ***Price:*** *£1.99.* ***Originality:*** *6/10.* ***Graphics:*** *6/10.* ***Playablity:*** *6/10.* ***Value:*** *7/10.*



ANTIRIAD

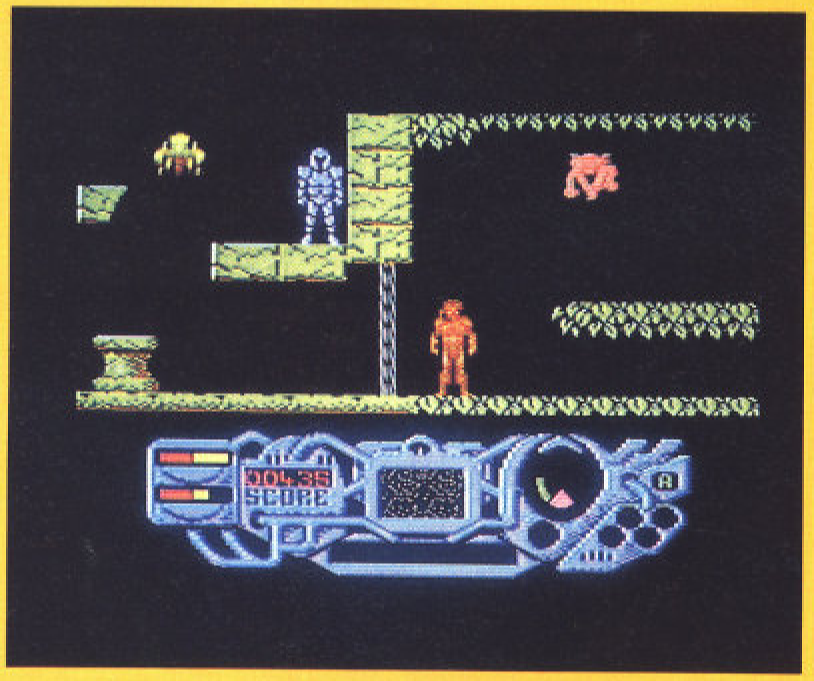
After the inevitable nuclear war, and the horrendous nuclear winter, the earth begins to recover. From the chaos has emerged a new race of man. Strong, brave and hardy, but peaceful and simple too. The only shadow over their lives is the superstition surrounding the ancient city, half buried at the foot of a volcano.

Suddenly, from the sky appears a strange peril. An alien race, ruthless and bloodthirsty, massacre hundreds of a simple people and put them to work in the mines. They make the ancient volcano their headquarters and the location of their power source.

But the young race does not give up hope. Secretely they raise young boys to reak revenge and save the race. One hero emerges: Tal. He is sent into the heart of the volcano to find the ancient sacred armour (in reality an anti-red combat suit) and with it he must destroy the power source at the heart of the volcano.

The first thing to do is to get through the forest, avoiding the many extraterrestrial bugs which lurk there, and reach the armour. When you get to it you'll find that you need anti-gravity boots and a blaster. So you have to get out of the armour and find the boots which are at the top of a tree, then get back to the suit and float about to find the blaster.

All of this involves an awful lot of death destruction, mainly for you, because when you're not in the suit with your blaster, the only way you can kill anything is by chucking rocks at them. However you're aim's not bad so there's hope for you yet.



On the whole it's quite a nice game, graphics are reminiscent of Cauldron II, and are varied and interesting. It's also very difficult so you'll need quite a bit of practice especially to get the hang of that floating feeling when you've managed to get the suit on the go. Make sure you pick up lots of powercells as you go about, though, because if you run out the suit dies and you have to get out. That's not nice if you're deep in the volcano! **M.C.**

Touchline:
Title: *Antiriad.* ***Company:*** *Palace Software, 275 Pentonville Road, London N1.* ***Tel:*** *01 278 0751.* ***Machine:*** *C64.* ***Price:*** *£8.95.* ***Originality:*** *8/10.* ***Playability:*** *7/10.* ***Graphics:*** *9/10.* ***Value:*** *8/10.*



MARBLE MADNESS

This one is a strange game from Electronic Arts courtesy of Ariolasoft. You're a marble, and you have to negotiate various 3D mazes. The problem with being a marble is that it's very difficult to control our movements. A gentle shove with the joystick to the left and you find yourself careering off the edge of the play area into an abyss.

Level one (of six) breaks you in quite gently and it may be worth your while hanging around a bit on this one just to get the hang on the controls. Each level has its own music, level two's is very good, level four sounds like a chimp has been let loose on a synth!

To be honest, I couldn't really get addicted, although I know people who are. One of the main reasons for this is that each level loads separately from disk and this seems to take an awfully long time. The apparent reason for this is the sophistication of the graphics and sound. The graphics are truely wonderful, with beautiful colours and very effective 3D landscapes.

Hazards to avoid include marble eating worms, steelies which are black marbles which try and push you off the edge, bonuses to be gained if you get them first. There are vacuum cleaners which suck you off course and plenty of slopes and bumps to send you spinning into oblivion.

If you like a game which is totally frustrating and very different then this may keep you occupied for hours even if it's only to stare at the fascinating mazes. Definitely worth a try. **M.C.**

Touchline:
Title: *Marble Madness.* ***Company:*** *Ariolasoft, 68 Long Acre, Covent Garden, London WC2E 9JH.* ***Tel:*** *01 836 3411.* ***Machine:*** *C64.* ***Price:*** *£14.95 disk.* ***Originality:*** *10/10.* ***Graphics:*** *10/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.* YC

ROBOBOLT

They say that imitation is the sincerest form of flattery. If that's the case then Andrew Braybrook should be feeling very flattered indeed. Robobolt, is yet another attempt at a Paradroid cum Uridium cum etc. sort of game. For my money though, this attempt has not succeeded half as well as some recent releases.

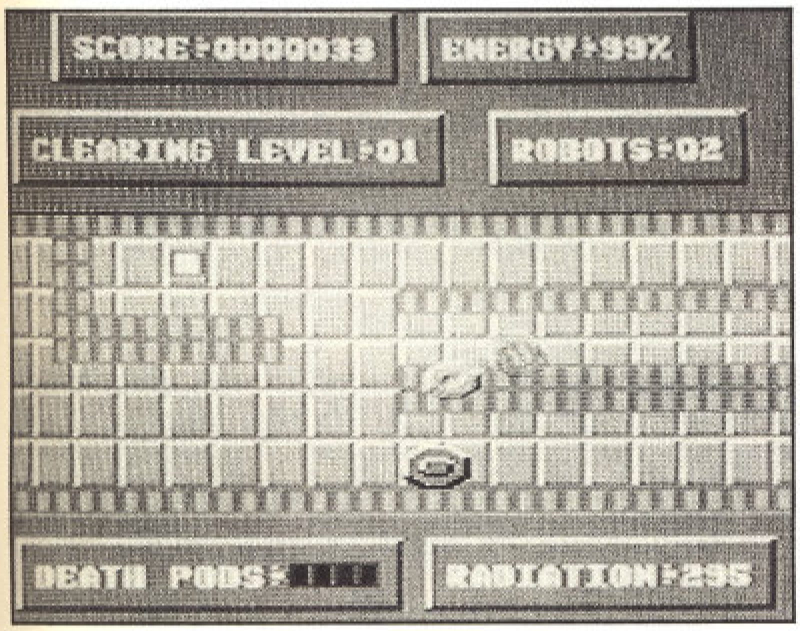
The basic principle behind the program, is to collect Death pods, place them in the assembly area, thus enabling you to warp to the next level. There are four pods to collect on each level. The only trouble is, they have to be collected in the correct order, otherwise they will be rejected. Whilst you are running around, trying to find the pods, your energy is diminishing rather rapidly. Energy can be maintained by shooting the aliens roaming around, (two per level as far as I can tell). To add to your troubles, you have a nasty time counting down, which seems to be in permanent turbo drive.

The copy that I reviewed had no sound at all, (except for an opening number). The control of your craft is somewhat sticky also.

All in all I found this program a little mundane and uninteresting for my liking but at £1.99 who's complaining?

P.E.

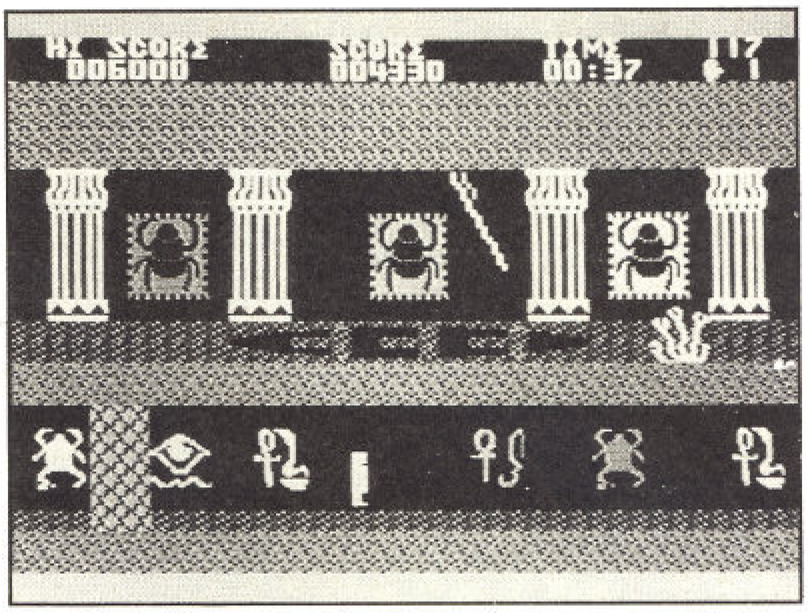
Touchline
Title: *Robobolt.* ***Company:*** *Alpha/Omega, 9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2918.* ***Machine:*** *C64.* ***Price:*** *£1.99*
Originality: *4/10.* ***Graphics:*** *5/10.* ***Playability:*** *4/10.* ***Value:*** *6/10.*



ORPHEUS IN THE UNDERWORLD

After playing Orpheus in the Underworld for quite a few hours, I'm still not sure exactly what you are supposed to do. Obviously your task is to get out of Hades. How you do this is a mystery. Granted you can collect treasures on your travels, just how they help you, though, is not clear.

The game comprises of lots and lots of screens (well actually, it's just one screen with a few different things in it each time).



To get about, you have to jump over pits, swing from ropes and cross chasms. The one really novel idea in the game, which I personally found a bit annoying, is that the music only plays if you are moving. Stand still and the music stands still also.

The backdrops are somewhat confusing. I was always under the impression that the underworld was Hades, not the inside of an Egyptian tomb (well we live and learn).

Not wanting to seem all gloom and doom, the game does have a little of the elusive, 'I must just have one more go' about it.

P.E.

Touchline
Title: *Orpheus in the Underworld.* ***Company:*** *Alpha/Omega, 9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2918.* ***Machine:*** *C64.* ***Price:*** *£1.99.*
Originality: *4/10.* ***Graphics:*** *4/10.* ***Playability:*** *5/10.* ***Value:*** *5/10.*

COMPUTER HITS 3

Compilation tapes are all the rage at the moment and Computer Hits 3 is one of the better examples of the genre, offering 10 different titles. The emphasis is heavily on action and, unlike certain rival products, none of the games are really naff.

First off the block is Geoff Strongman Challenge. A training session allows you to build up certain muscles before going on to compete in events such as barrel loading, fairground bell and sumo wrestling. Elidon is an arcade adventure in which you play a faerie trying to find potions and flowers in order to make a garland for the Queen.

Blagger goes to Hollywood sees you trying to knock out 12 different stars with assorted props in an attempt to gain access to Speilbum's office and steal a film. Cauldron puts you in the part of a witch trying to rid the land of the evil pumpkin and thus becoming the witch queen. The first tape ends with 3D Lunattack, a mix of strategy and shoot-em-up as you try to protect your base from the invading Seiddab forces.

Still one of the most popular games in the office, Crazy Comets is a highly addictive shoot-em-up in which you blast

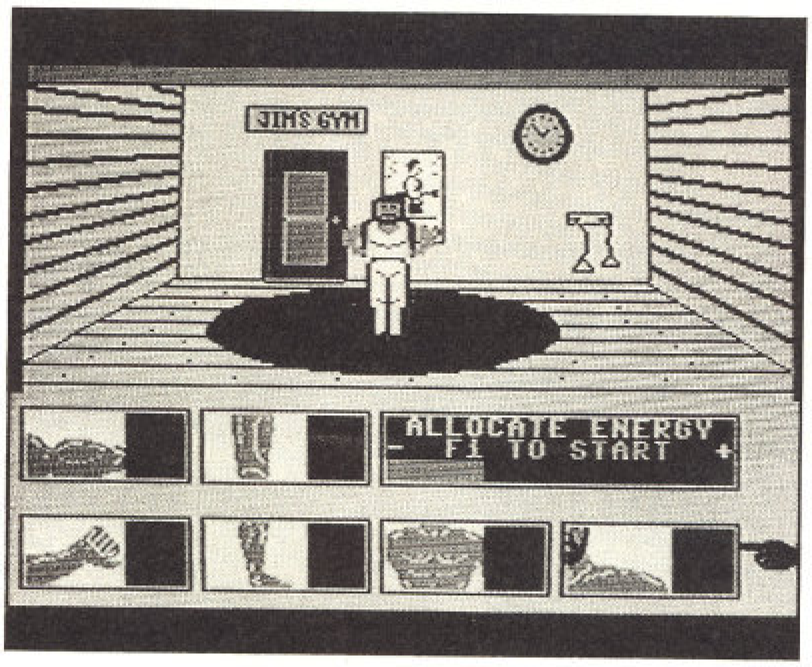
planets before they turn into supernovae. Dynamite Dan is a platform game in which you must find eight sticks of dynamite with which to blow up the safe of the evil Dr Blitzen who has plans to destroy the world. Herbert's Dummy Run is set in a toy store with young Herbert trying to find his lost parents and eating jelly babies as he goes to keep his strength up.

Attack of the Mutant Camels is one of the first games that I ever played on the 64 and it is still a classic blast from the past. What else could it be but a Jeff Minter game with a name like that. The final game is another arcade adventure, The Adventures of Bond – Basildon Bond, based on the Russ Abbot character. The object is to match jokes with punchlines as you attempt to rescue Russ who has been kidnapped by a rival comedy act.

None of the titles are the sort of games where you think 'I must have that', but they are all average plus and 10 games for the money must represent good value.

G.R.H.

Touchline
Title: *Computer Hits 3.* ***Company:*** *Beau Jolly, 29A Bell Street, Reigate, Surrey RH2 7AD.* ***Tel:*** *07372 22003.* ***Machine:*** *C64.*
Price: *£9.99.*
VAlue: *9/10.*

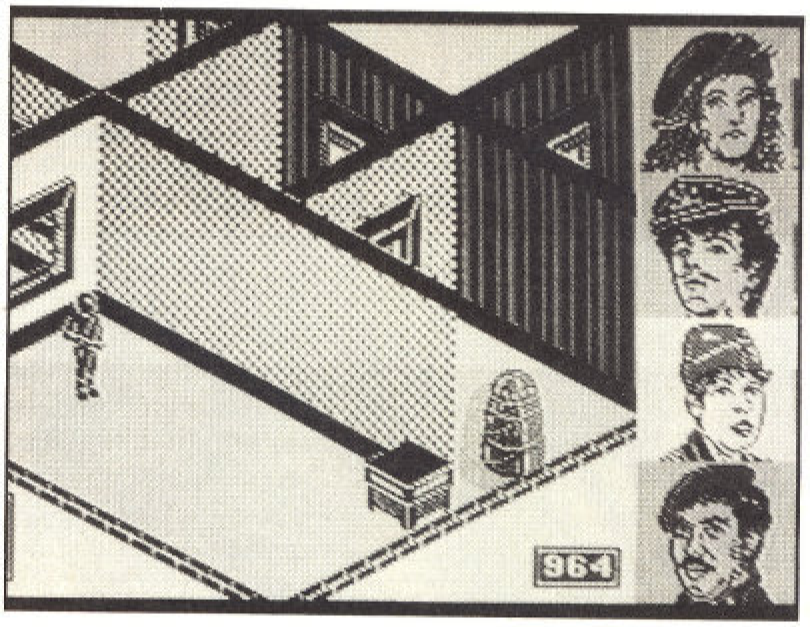


STRIKE FORCE COBRA

Be warned, Strike force Cobra is not a game to be completed in one sitting. This program will only be mastered by cunning strategy and patience on your part.

The principle of the game, is to destroy the main computer of the enemy, before he blows up the entire world. To this end you pick a team of four superheroes, from a list of eight. Each of you team is a master in one particular field. It's up to you to select the best team for the job. Once your team starts its mission, control of each member is achieved by simply pressing the corresponding number key (ie: two will make number two hero under control).

The complex is represented in 3D style, therefore movement takes some time to get used to. There are numerous obstacles to overcome: Electrified pressure pads,



robots, armed guards, locked doors, video cameras to name but a few. How you overcome each obstacle is a matter of trial and error.

There are some good sound effects used within the game. The only real criticism is the method of controlling/using your men (combinations of keys, F-keys and joystick). I always have difficulty remembering what does what.

For people tht like killing, maiming and generally causing havoc – with strategy as well, then this is a must. I've purposely not said too much about the game for fear of spoiling it for you. Go out and buy it.

P.E.

Touchline
Title: *Strike Force Cobra.* ***Company:*** *Piranha, 4 Little Essex Street, London WC2R 3LF.* ***Tel:*** *01 836 6633.* ***Machine:*** *C64.*
Price: *£9.95.*
Originality: *6/10.* ***Graphics:*** *7/10.* ***Playability:*** *8/10.* ***Value:*** *7/10.*

ACE OF ACES

The Mosquito was one of the great triumvirate of British warplanes during WWII, together with the Spitfire and Lancaster and was certainly the most versatile of the three. Very fast and manoeuvrable, it was used in both offensive and defensive roles. Ace of Aces puts you in control of a Mossie and gives you the chance to try your hand at several different missions.

You can choose to fly on just one or a combination of missions from those available for selection. Possible targets include V1s, U-Boats and trains. An intelligence briefing gives you specific target locations together with weather details and you must then arm your plane. Depending on what you are trying to hit, you can choose from rockets, bombs and cannon. You should also fill up with fuel at this stage.

Once you have taken off (done automatically), you have total control of the plane. Two quick presses on the fire button and you can move the joystick to select pilot, navigator, engineering and bomb aiming functions. The navigator screen shows a map of you in relation to your targets. Bomb aiming involves opening the bomb doors and

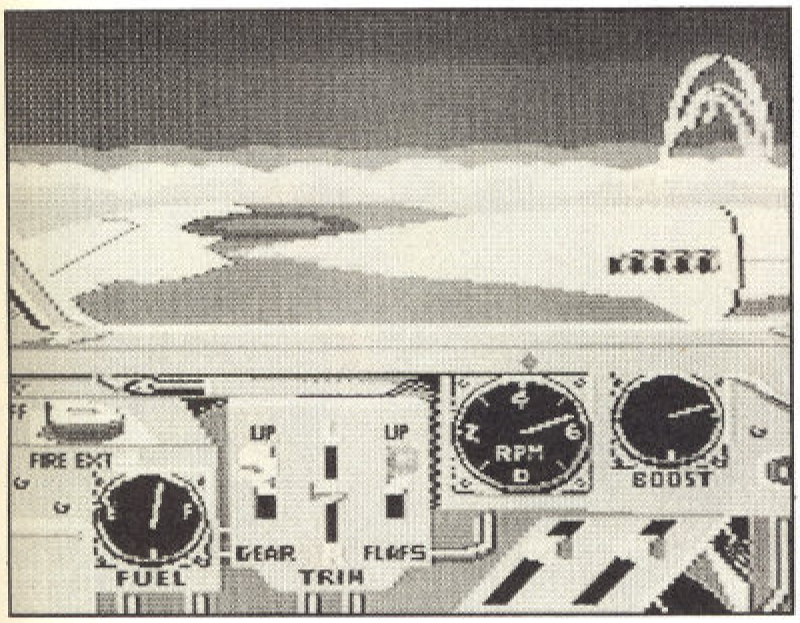
selecting the appropriate weapon or auxiliary fuel tank. The engineer screen shows the view over the left or right wing and gives you access to throttle and flaps control as well as a fire extinguisher should you come off second best in a dog fight. All the different functions are controlled by moving a marker to the appropriate dial or switch. There is no multitude of keys to try and remember.

The main part of the game is obviously with you in the pilot's seat. Again, there are only a few dials for you to keep your eyes on – airspeed, altimeter, compass and radar being the main ones. The only real problem comes when you are in battle. It is all too easy to get carried away and press the fire button twice in quick succession which promptly takes you on to a different screen.

The best part about Ace of Aces is that, unlike other flight simulators, it is very easy to get into. This does not mean that it easy to play, far from it, but there are practise modes to let you get the hang of things. Other nice features include the use of cloud when you can't see a thing and the awarding of minus points if you hit the wrong targets so that you can't just go out blasting everything in sight. All in all, a very well thought out and highly enjoyable simulation.

G.R.H.

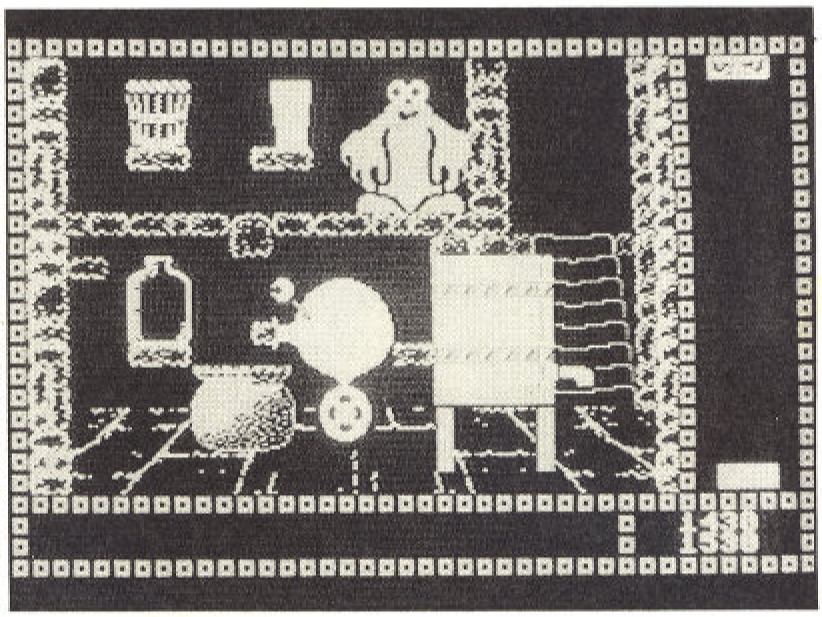
Touchline
Title: *Ace of Aces.* ***Company:*** *US Gold, Units 2/3 Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.95.*
Originality: *8/10* ***Graphics:*** *8/10* ***Playability:*** *9/10.* ***Value:*** *8/10.*



TRAPDOOR

Based on the children's TV series of the same name, The Trapdoor stars a large blue, cuddly character called Berk who is responsible for the welfare of a nasty piece of work known only as 'im upstairs'. The Trapdoor in question in situated in the kitchens of the castle and contains a whole series of the most horrible monsters imaginable who, needless to say, always manage to get out whether by accident or design.

In the game, 'im upstairs' has decided that he wants



feeding and orders Berk to concoct such delicacies as a can of worms, boiled slimies and eyeball crush. The various bits of equipment needed are to be found lying round the various needs but Berk also needs to open the trapdoor and let out one or other of the monsters to aid him in his task. For example, to fry the eggs, Berk must first release the bird and find some way of making it lay the eggs before he can collect and cook them.

Objects can be picked up and carried and tipped up to reveal their contents. Levers are operated just by standing next to them. The attention to detail is excellent both in the animation of the characters and the methods necessary to produce the dishes. You have two so called friends to assist you. Boni, a skull, will give you a clue if you pick him up but Drutt, a small bouncy creature seems more of a hindrance then a help. He loves eating the worms that you are trying to catch. The solution lies in finding some way of enticing him to fall down through the cellar.

The game's graphics are extremely large and colourful but they do suffer from attribute problems! I know what you are thinking – if you wanted those, you would have bought a Spectrum and what makes the pill even more bitter to swallow is that the Spectrum version doesn't suffer from the problem! But this is only a minor hiccup in what must surely be one of the most original and enjoyable games of the year.

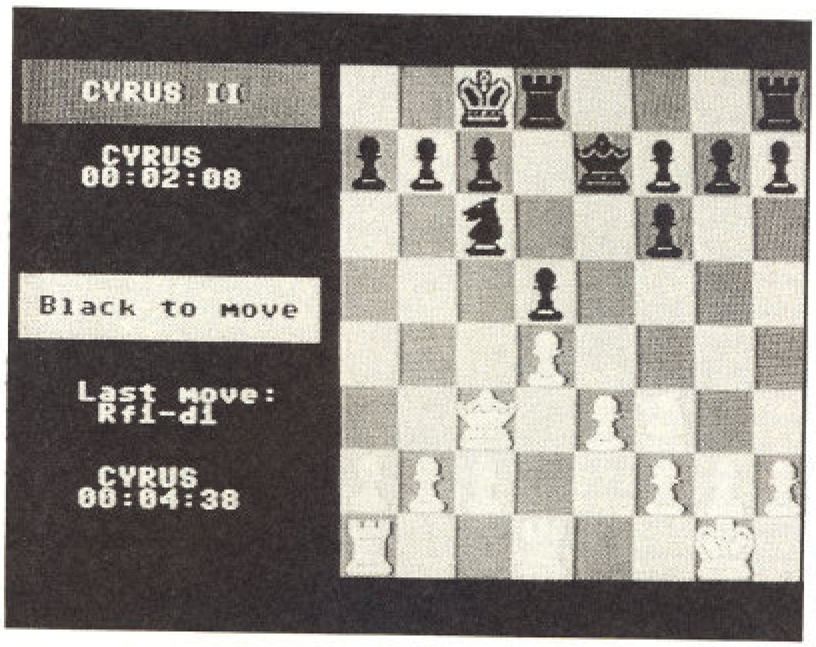
G.R.H.

Touchline
Title: *Trapdoor.* ***Company:*** *Piranha, 4 Little Essex Street, London WC2R 3LF.* ***Tel:*** *01 838 6633.* ***Machine:*** *C64.* ***Price:*** *£9.95.*
Originality: *10/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*

CYRUS CHESS II

With all the interest in the recent World Championship between Garri Kasparov and Anatoly Karpov, it is not really surprising that there should be a corresponding interest in chess programs. Cyrus II is one of the better programs around, both in ability and presentation.

The game's presentation is what struck me most about the Cyrus II. The pieces are large and clear and easily



distinguished, something that cannot always be said for other chess programs. Moving is simplicity itself. Select a piece with the cursor and it changes colour so that you can see instantly that you have selected the one that you wanted. Similarly when you select the desination square. There is no need to bother with algebraic notation or P-K4 or whatever. If the computer won't accept your input, it is because you are trying to make an illegal move.

Pressing the space bar brings up a list of options as well as details of the moves made so far. You can take moves back (shame on you!), change the computer's skill level, swap sides or even ask for a hint. Positions can be set up for problem solving and there is a demo mode if you get fed up of being beaten.

The crunch question when it comes to considering any chess program is how good is it and similarly, it is almost impossible to answer. For any beginner or someone who is out to improve their game, any program should suffice. The optimum is to set the skill level just a little bit better than you are. For the more serious player, Cyrus II will still provide a strong challenge although you would ideally need to try a few games to assess its ability against yours.

But for the majority of players, Cyrus II makes an ideal opponent and should be high on your list of programs to consider.

G.R.H.

Touchline
Title: *Cyrus Chess II.* ***Company:*** *Alligata, 1 Orange Street, Sheffield.* ***Machine:*** *C64.* ***Price:*** *£10.99*
Originality: *5/10.* ***Graphics:*** *8/10.* ***Playability:*** *8/10.* ***8/10.*** ***Value:*** *8/10.*

FIST II

After all the hype, Fist II – the Legend Continues has finally hit the shelves. The original, you may remember, was the first of a plethora or martial arts game. Way of the Exploding Fist was a straightforward karate simulation, you trying to knock bits out of your opponent before he did likewise to you. In this sequel, Melbourne House has kept the same combat ideas but transferred the action to an arcade adventures.

The scenario is that the Warriors of the Exploding Fist have been betrayed over the centuries and the land is now under the rule of the evil Warlord. Nobody has seen his fortress but plenty of rumours exist, featuring volcanoes and underwater labyrinths. The fighting secrets of the Masters are supposed to be hidden somewhere in the land in the form of scrolls and there are shrines and temples to be found where an aspiring master can meditate and seek guidance. Such a person is you. Although initially weak and inexperienced, the elders hope that you possess the necessary talent to overcome your common adversary.

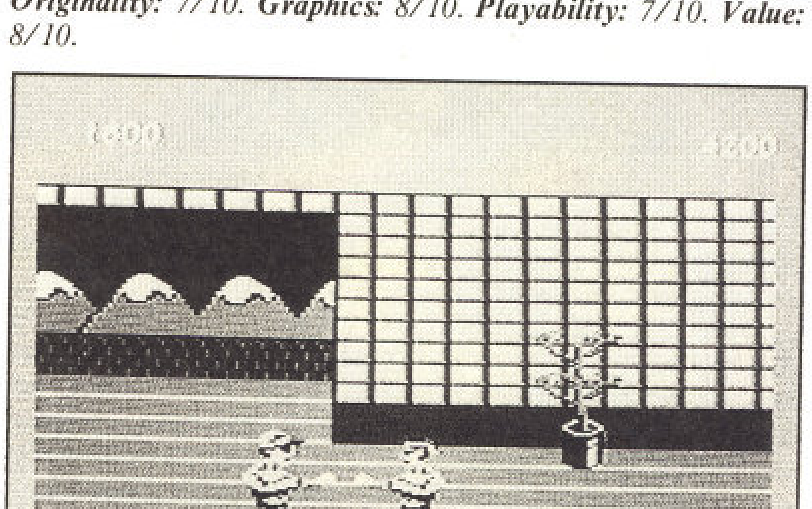
The scrolls that you must find contain knowledge in the form of trigrams. The secret is to match that trigram with the appropriate temple and thus learn its secrets. For example, Ch'ien is associated with strength and Tui connected with imparting a sense of well being when surrounded by malignance. Temples are also important as they restore your energy and heal you should you be poisoned.

There are a variety of foes for you to fight ranging from simple but aggressive peasants to mighty Shoguns and deadly assassins. There are also creatures of the wild to be faced, snakes and panthers etc. The action takes place in a variety of locations – outside, in buildings and caves and even in water. This last location is tricky as not all your moves are effective here. Movement is only from side to side but there are pits to fall into and ladders to climb. The only annoying part of the game is as you move round, waiting for the next screen to catch you up – you move off one edge and then action is suspended as the next one scrolls past you.

The idea of a quest rather than just straight combat works very well indeed as there is the added impetus to have just one more go and find out what is behind the next corner. Be warned though, your task will not be an easy one and you will have to do really well before the warlord even takes notice of you. Fortunately, you have the option to practise all your moves beforehand. Side two of the tape contains a training mode. A nice touch from a game destined to head the charts.

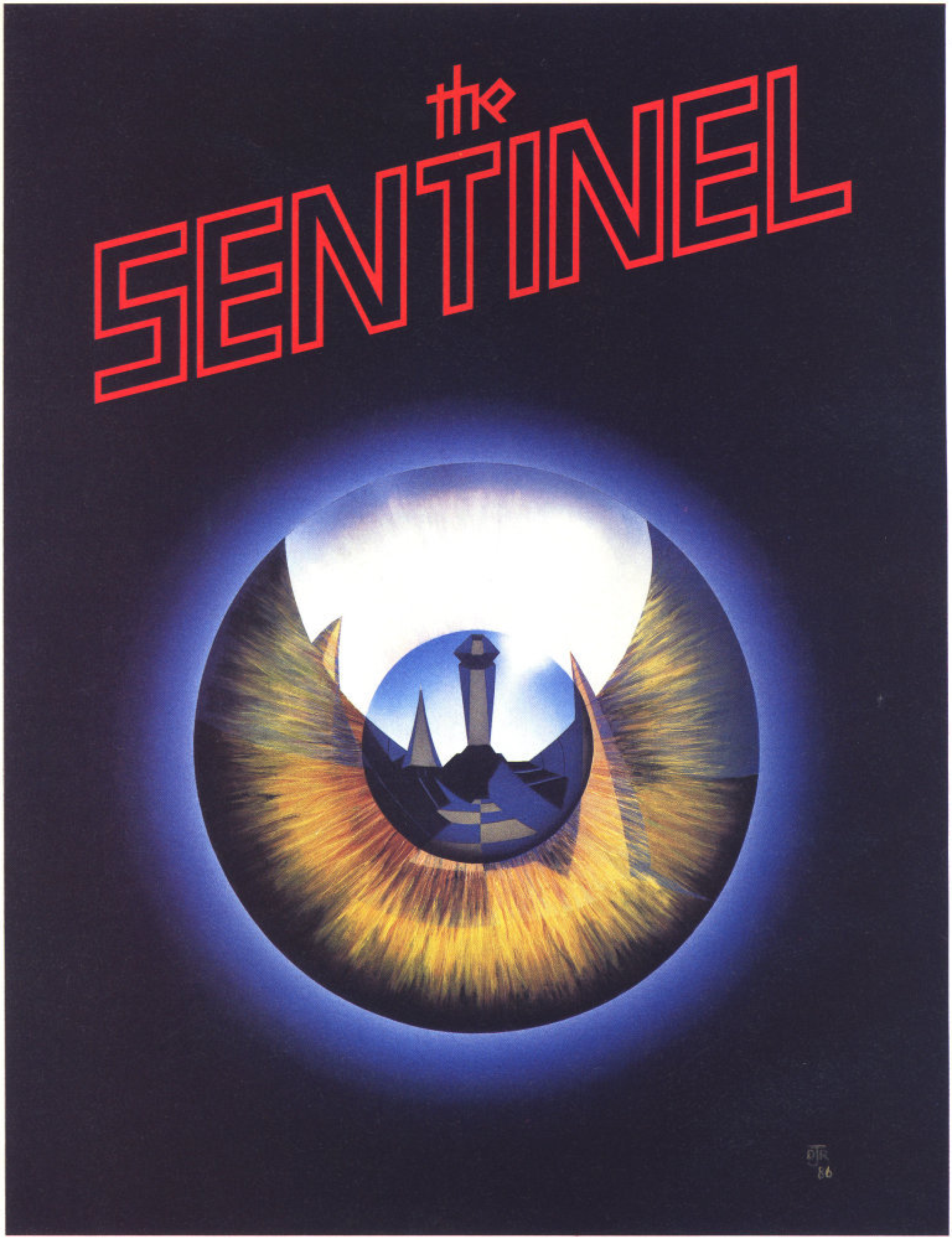
G.R.H.

Touchline
Title: *Fist II.* ***Company:*** *Melbourne House, 60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.* ***Tel:*** *01 943 3911.* ***Machine:*** *C64.* ***Price:*** *£8.95.*
Originality: *7/10.* ***Graphics:*** *8/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*



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Micro Clerk

JCL's combined Wordprocessor, database, spreadsheet and book-keeping package is just what small businesses have been waiting for.

By Stuart Cooke

Small businesses would quite often benefit from the purchase of a small computer to help them keep track of their books etc. However when it comes to purchasing a machine many poeple are put off by both the cost of the computer and the actual cost of the software.

To overcome this problem JCL Software has produced an integrated small business package that will run on what is a relatively cheap computer, the Commodore 128, called *Micro-Clerk. Micro-Clerk* will handle most of the paperwork that a small business will require including typing letters and documents. Filing information and retrieving it, producing cashflow forecasts and probably most important book-keeping including profit/loss and VAT accounts. The package doesn't even stop here it goes on to provide such things as calculators, note pads etc. But more of this later.



First Glance

Micro Clerk comes complete with two disks, a manual and a dongle. In case you have never heard of a dongle, this is a small security device which plugs into your computer, in this case the joystick port. The program will only work if this dongle is in place. This means that you can make as many security copies of the software as you require but can only use them with the dongle.

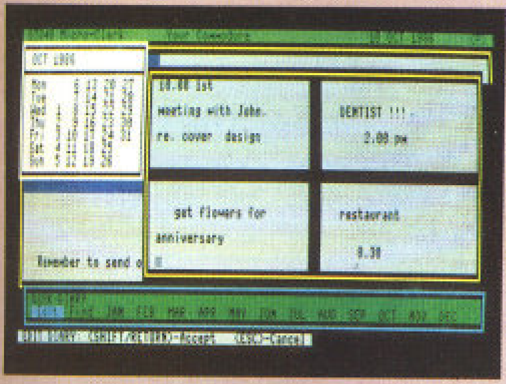
The manual is clearly written and put together in such a way that even a complete newcomer to computers will be happily using the software within a few minutes of getting it home. It starts by giving a brief overview of the package and then goes on to give hints and tips to beginners such as telling typists that the letters l and o cannot be used instead of the numbers 1 and 0 as they are on many typewriters. The simple style of the manual is lightened even further will small cartoons and pictures spread around the documentation, all of course illustrating some very important point, such as keeping your pets away from your disks.

Floppy disks are dealt with in detail and it clearly explains what you can and can't do with them and the fact that you need to back up your software for security is continually repeated. In fact, the software is written in such a way that it is impossible to use the disks that are included with the package. As soon as you LOAD them into your computer you are whisked off into the backup section of the program finding yourself copying the disks.

As I have mentioned the software is supplied on two disks, this means that a certain amount of disk swapping is involved even if you have two drives, one for the software and one for your data disks. However if you own a 1571 then it is possible to fit all of the software on one disk which means that you could leave it in the drive. JCL has said that they will produce single disks versions of the software for people who contact them.

Training

When confronted with anything new it's usually advisable to go on some sort of training course to learn all about it. *Micro-Clerk* comes complete with a five minute Training guide to



typing and filing which will get you used to the package and some of its capabilities.

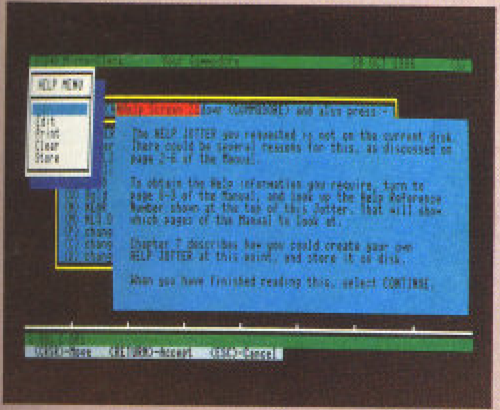
Notice

Upon loading the program you will be presented with a notice board. Here you will find any message that the previous user has left for you. An alter date function lets you set up todays date for use within the program while the Diary function allows you to look at the selected months appointments, birthdays etc.

Once you have finished with the notice board then it's on to the main menu. Here you can select at the press of a key the following options:

Accounts – the book keeping functions
Typing – the wordprocessor for typing letters
Filing – the database
Spreadsheet – for cashflow forecasts
General – Altering screen colours, company name etc.
Backup – Copy a disk
Close Down – Finish for the day and edit noticeboard

One extremeley nice function is the ability to press the HELP key at any time. Should you press the key while on the main menu a help screen similar to the above is given together with where you can find more information within the package. When help is



selected you are also given the chance of printing the help screen out and editing the screen.

Wordprocessing

Should you select typing from the main menu then the computer will go away and load the Wordprocessor from disk. Again you will be presented with a menu of options, as with the main menu. These are:

Edit text
Load from disk
Store on disk
Print on paper
Clear textspace and
Destroy text file

I think that all of the above options are self explanatory and therefore need not be dealt with in more detail.

The wordprocessor isn't as flash as some of the dedicated wordprocessor programs that are available on the market it does however offer a few 'nice' functions which make it both pleasant and easy to use. Options available to the user are as you would expect inserting and deleting of lines and characters, an automatic insert that allows you to add text in the middle of text already entered. Unlike with a typewriter the only time that you are required to enter a carriage return is when you want to force a line feed, such as at the end of the text. The program has an automatic word wrap which will prevent the rest of the paragraph from appearing on one line.

The find option allows you to search any word in the text making it easy to move around the text.

The block functions allow you to delete blocks of text from your article as well as print them or move them elsewhere.

If you are lucky enough to own a printer that supports such features as Underline, Italics or Near Letter Quality then you can make use of these. The setup printer section of the program allowing you to customise the program for specific printer.

A couple of extremely nice and useful touches to this word processor are the *date and *name commands. Whenever these are found within a document the program will automatically insert the current date, entered when loading the program and the name and address of your company.

For companies who have large mailing lists you will no doubt find the mailmerge option of use. This will allow you to insert information within your text that has been retrieved from the database, for example the name and address of all your clients. Provision is also made to allow you to enter a merge list, the information to be entered into the text, from the keyboard which is useful for those one off letters. A number of advanced features are included here with allow you to perform calculations on information before it is entered into the letter you can even set the number of decimal places that are used when printing numbers.

All in all the wordprocessor is excellent for producing small documents or letters. As I have said none of the fancy features available with larger wordprocessors, such as spellchecking, are present but it will make sending out letters etc. much easier.



Storing Data

The database or filing section of the program is where you can store information such as names and addresses or items in stock.

For those of you who may have never come across a database it can be viewed as a type of electronic card index box. As with the cards yu can decide what information that you wish to store and in what format you want to hold it. However a database is much more flexible. Let's say for example that you have a list of club members stored under their surname. The file may contain their name, address and whether they have paid their subscription.

Now let's say that you want a list of all people who hadn't paid up. With the card index system you would have to go through each card in turn taking out the people who hadn't paid. With a database then you could ask it to give you a list of people who hadn't paid

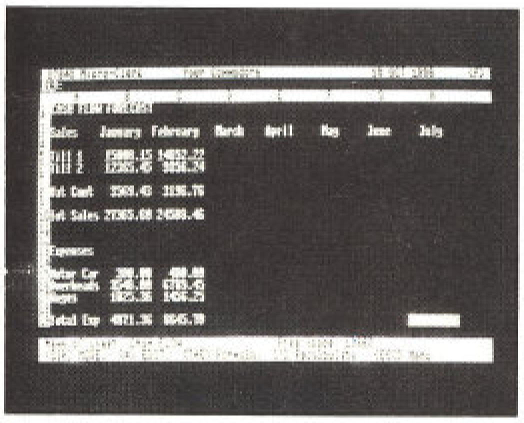
and it would do so almost immediately. Further more you could then get the computer to print out a reminder letter to them with the amount they owe, complete with their name and address in the relevent parts of the letter.

Defining the layout of your file is extremeley easy. When you design the way that it's going to look you can specify that particular entries must be text, numeric only (with a limit on decimal places) or a date field. Once a database has been set up there are no problems sorting it into any order that you require, for example you could produce a list of people who live in London in alphabetical order. It is even possible to put several different conditions that must be met. For example you could ask for a list along the following lines:

A list of all the people living in London whose subscription has run out.

As you can no doubt appreciate this is much easier than having to do it by hand.

When printing the information from within *Micro-Clerk* it is possible to select REPORT format or LABELS format. The REPORT function allows you to print a neat report with up to eight lines given over to each record. You can decide how you want the printout to be laid out and the fields that you require printing.



Labels, as the title suggests, allows you to print out the information stored within *Micro-Clerk* on to self-adhesive labels. Each label can have up to six lines printed on it and up to three different fields. You can print either one, two or three labels across the paper.

Spreadsheet

A spreadsheet is of use to anyone who has to produce a lot of related calculations, for example a forecast on the cashflow of a company. Usually these forecasts are produced on large pieces of paper split into rows or columns. Specific information is placed into the gaps remaining. Then calculations are carried out on either the rows or columns to show totals.

The computer version of this is called a spreadsheet. The screen acts as a window over the larger spreadsheet allowing you to see specific portions of your data. You can type headings, figures and formulae into any locations on the sheet, then once the data has been entered you can perform calculations at the press of a button.

The spreadsheet offers all of the usual facilities associated with such a program. As with all the sections of this software the use of the program is clearly explained and you should be able to use it without too many problems.

Cash Book

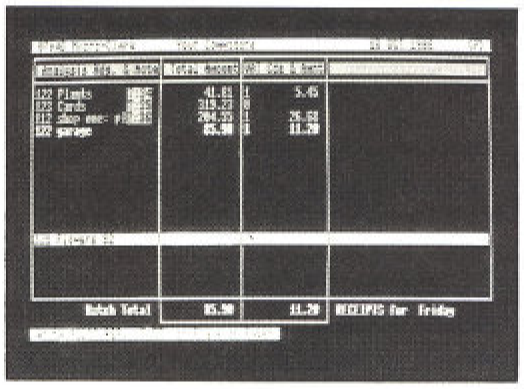
The cashbook will probably be the most important part of the software package. It allows you to simply type in details of everything you buy and sell. You have the option of doing this each day, or every few days, as long as you keep the information accurate and as up to date as possible. At the end of each week you select the END OF WEEK function which will automatically print out a list, in the form of double-entry account book pages, of everything entered during the last week. Even tedious things such as VAT are taken care of.

The facility exists to produce Profit/Loss reports at any time showing exactly where you are spending most money, and how much you have spent this year.

As with all of the programs in this package you are presented with the various options when the program starts. Available to you are:

Entries which allows you to enter details of income payments, bankings etc.
Print – allows you to print out lists of all information entered.
General – Setting up the cash book
Headings – This allows you to alter the Analysis headings and print out various types of reports.

Up until now I have stated that accounts are produced on a weekly



basis. One nice feature is that you can select to work on a monthly basis should you prefer.

Setting up the program to suit your own business is extremely easy, all of the headings being under your control. The only slightly confusing thing is that you must give each heading an analysis code. These codes must be in the range of 100-999 as well as there being special groups within there. For example codes heading in 00 are main group titles. You can of course print off a list of headings and codes at any time.

Should you choose the entries option of the program then you will be asked what type of entry that you wish to make to the system. Options available are Receipts, Bankings, Payments, Transfers and Standing orders. All of which need no further explination.

At some stage within the program you will require printouts of specific details from your cash-book. All of the following are available and will no doubt keep you accountants happy for quite a while:

Audit Trail – A list of everything that you have entered this last week.
Sales Report – A report of cash sales, and any other income.
Sales Analysis – A list of the total sales of each heading for the current week.
Purchase Report – A record of everything that you have purchased over the last week
Purchase Analysis – Total purchases for the last week under each heading.
Money in/out – A list of all money received or paid out by the business during the last week.
Bank Report – All entries affecting your bank account.
Transfers – A list showing all transfers you have entered during the past week. Evidently this is what accountants call a Nominal Journal.
Stock by Value – A list showing a summary of each stock group and its values.

Day Analysis Sales and Purchases – A list of all sales or purchases for each day of the week.
Trading – This shows all Sales, Purchases and Expenses during this period, and then produces a calculation of your Gross and Net profit.
Balance Sheet – A balance sheet for your business.
VAT Report – A VAT report can be printed at any time though you only need one when you are required to fill in a VAT form each quarter.

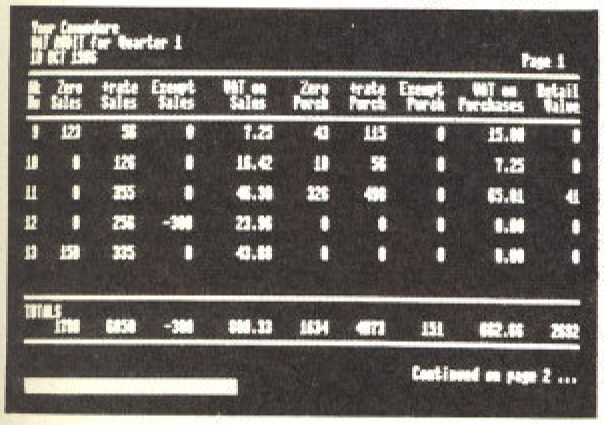
That just about covers the cash book operations of the program. As you can no doubt see it is extremely comprehensive and obviously far easier to use than a number of books. The number of different reports that can be produced should definitely keep your accountant quiet for quite some time.

Bits and Pieces

I have covered the main sections of the program above, however there are quite a number of smaller but very useful facilities available within the program. I have already mentioned the use of the HELP key and that it gives a brief description of whatever you are doing together with the page number of where to find more information in the manual. As well as the help key many others have functions.

F1 will allow you to access the programs disk functions. From within this option you can Display the files on the disk in the drive that are relevant to the section of the program you are using. You can print a full list of all the files should you require. Free Space will tell you just how much room is left on your disk and you can format new disks when the need arises.

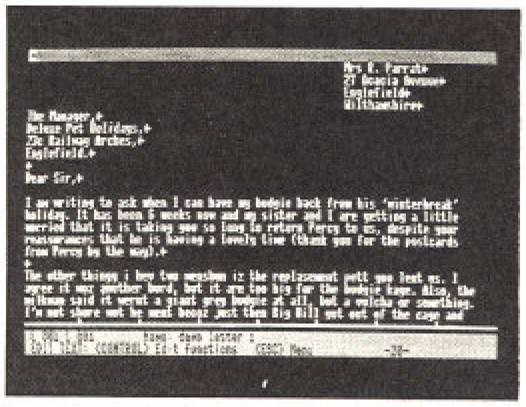
F2 calls up the printer options. Here you can set the size of the paper that you are using, tell the printer to move to a new page, check that the printer is on-line and ready to use.



Page Pause will set the program up in such a way that the printout will pause after each page, this will allow you to use single sheet paper.

The Printer Yes/No option is quite an oddity, although quite useful, as the program can be forced to produce all printouts to the screen rather than to the printer.

The Linefeed key at the top of the keyboard can be used at any time to move the paper up one line in the printer.



Function Key F3 gives you access to what is probably one of the most useful facilities, that of the electronic jotters.

Electronic jotters allow you to use all or part of the screen as a form of notepad. This means that you could take telephone messages, notes etc. and place them in a jotter, just as you would do with a writing pad. The contents of a jotter can be recalled at anytime and reproduced on the printer.

The jotter can also be used to 'capture' whatever is on the screen when the F3 key is pressed. This means that you can copy the screen from one program, then using the paste function you can then place this information into another program. For example you may take a record from the database and then paste it into a word-processor file. Function key number 4 allows you to set the date, call up a calculator, handy for quick calculations, and use the printer as a type-writer, i.e. y ou can type a single line on the keyboard and then send it to the printer.

A diary is available on the F5 key. This will display a calendar for the current month on the screen. You can then set up a diary page for any month allowing you to set up appointments for the month etc.

Should you ever require a copy of the screen the F6 will provide you with a copy on the printer.

While you are in the accounts mode of *Micro-Clerk* you can examine any Analysis Heading, change the VAT code etc. This allows you to gain instant access to the amount of money in your Bank Account, or how much money is owed to you.

Verdict

Because this package is so comprehensive it is impossible to give you more than just a taste of what it can do. The package is continually being expanded, with new modules becoming available all the time. In fact I have just received Sales Ledger and Purchase Ledger programs that can be used with the program.

Because of the complexity and versatility of the program it is being given to an accountant and to someone who is just setting up a small business to use in a practical application. I hope that in a month or so I will be able to report their reaction to the program together with more details about the Sales and Purchase Ledger.

Amstrad and Alan Sugar have made a killing in the small business market with their range of small business computers that come complete with software. *Micro Clerk* is superior to that supplied with those machines and I am sure that the C128 and Commodore would have, and may still, get a larger share of the small business market if this software was given away with the machine. Even so since it is possible to purchase a complete C128 system with two disk drives and a printer for under £1000 this product is well worth taking a look at. YC

Touchline
Commodore UK: *1 Hunters Road, Weldon, Corby, Northants.* ***Tel:*** *0536 205555.*
JCL Software: 1 Sheffield Road, Southborough, Tunbridge Wells, Kent TN4 0PD. ***Tel:*** *0892 27454.*
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FITTING

Fitting involves the insertion of two sub assembly circuit boards, one in the 1541 and one in the '64/'128. These normally just plug in but on some '64s a small amount of soldering is necessary.

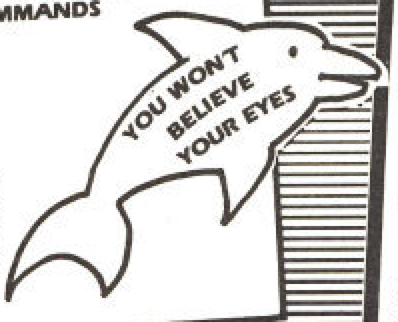
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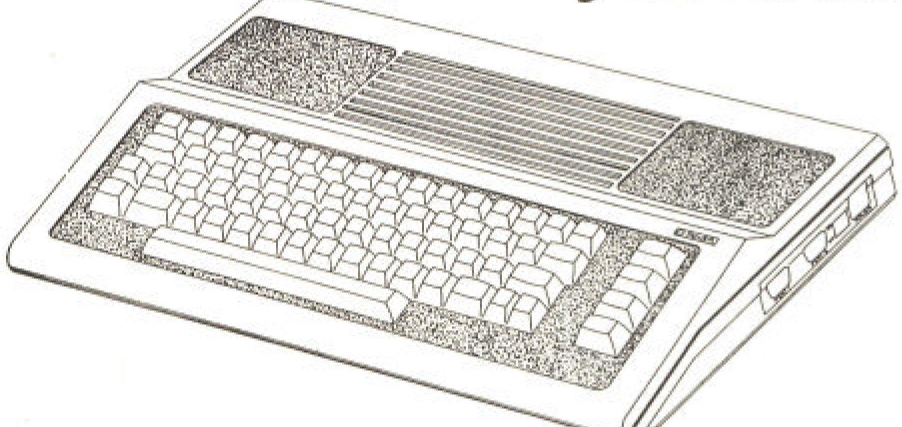
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On The Blink

Basic programmers take heart. This new software from Information Development Systems should make life a lot easier.

By Paul Eves

Calling all Basic programmers! Drop whatever you're doing and read on.

How many times have you been developing a large scale Basic program and wished that there was an easier way? Now there is because *Blinker-64* from Information Development Systems has come to your rescue.

Just what is *Blinker-64?* The answer is quite simple: *BLinker-64* is a linkage editor for Basic programs. It enables programs to be constructed from a number of small modules stored as files on one or more disks.

The main advantages to this approach to programming are firstly that small modules or subroutines are easier to handle, edit and debug. Secondly, programming in Basic is made more productive and enjoyable. Modules developed for one program can be saved as part of a library of modules and used as component parts of others as easily as standard Basic statements. As your library grows, so your ability to produce larger and more complex programs increases.

Basically, *Blinker-64* allows the programmer to make up a program of subroutines, then knit them togther to form a whole. The following example should show this clearly.

Normal Basic Program

```
10 POKE53280, 0:POKE53281,0:
POKE646,2
15 GOSUB500
20 PRINT "NOW IS THE TIME ETC
ETC"
20 GOSUB600
30 PRINT "PRESS ANY KEY TO
CONTINUE"
40 GOSUB 700
50 END
500 POKE53265, PEEK (53265) AND
239
510 RETURN
500 POKE53265,PEEK (53265) OR 16
620 RETURN
700 WAIT198,1:POKE198,0
720 RETURN
```

As you can see, this program is made up of a number of subroutines, some may be called repeatedly, others only once. Trying to keep track of all these subroutines in a large program can become tiresome. Moreover the next time you write something else you have to re-do all the subroutines again which can become very monotonous.

With *Blinker-64* the above program would look like this:

Blinker-64 Program

```
10 POKE53280,0: POKE53281,0:
POKE646,2
20 GOSUB"SCREEN OFF"
30 PRINT "NOW IS THE TIME ETC
ETC"
40 GOSUB "SCREEN ON"
50 PRINT"PRESS ANY KEY TO
CONTINUE"
60 GOSUB "GET KEY"
70 END
```

The subroutines 'screen off', 'screen on' and 'get key' would be individual files saved on your library disk.

When *Blinker-64* is invoked with your blink command, it runs through your BASE program (i.e. the one in memory). Whenever it comes across a GOSUB 'xxx', it fetches that subroutine from your disk and appends it at the end of your base program. After all operations have been done it renumbers the entire program, substituting your named subroutines for numbered ones.

The above files are known as CODE files. One other use of *Blinker-64* is the handling of DATA files.

The principle is the same, with a couple of exceptions. Data files can only contain REM and DATA token words. Any other token word would result in a fatal error.

There is a maximum of 255 distinct module references that can be appended in a single run. Line number values, previously considered important when appending or merging Basic programs, are now of little consequence. *Blinker-64* always produces a correctly numbered program, regardless of line numbers in any constituency source module.

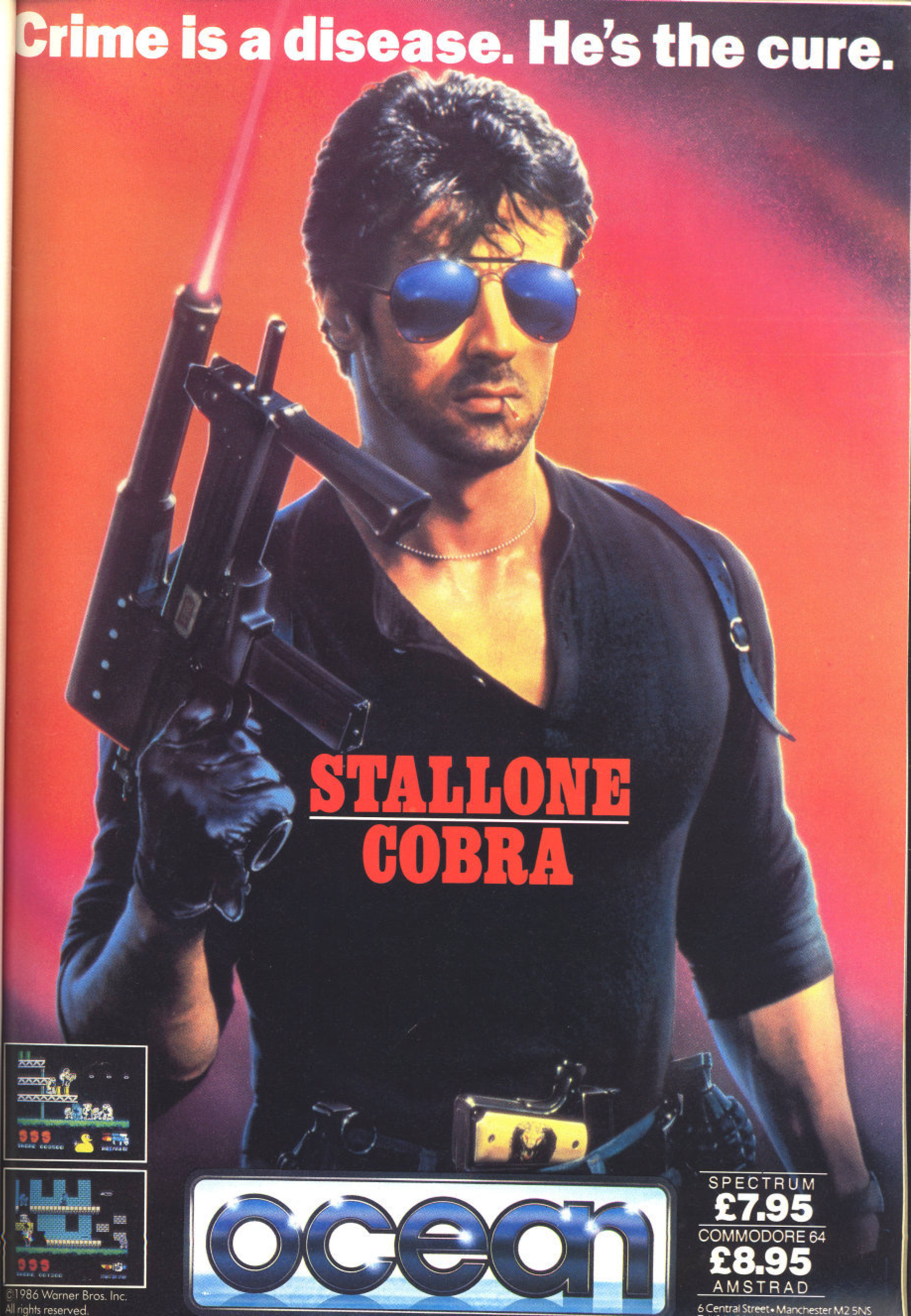
Whenever *Blinker-64* finishes a run, a summary screen is displayed giving some simple statistics about the linked program. The summary looks like this:

1. Start of BASIC – Lower limit of BASIC memory area
2. Start of VARIABLES – End address of BASIC program
3. Top of BASIC – Upper limit of BASIC memory area
4. CODE modules named – Number of Code modules included, including base mod.
5. CODE modules included – Number of modules in linked program
6. DATA modules named – Number of DATA modules specified on command line
7. DATA Modules included – Number of DATA modules included in linked program
8. Bad Filenames – Number of illegal module references encountered
9. Bad line numbers – Number of illegal line numbers encountered.

There is so much more I could say about the program, unfortunately space is running out. All I need say is that after trying this program out, I felt that no Basic programmer should be without it. YC

Touchline

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Disk Archive

A handy set of two programs to help you save your programs to tape in a convenient form.

By Jean Lebailley

The purpose of these programs is to copy whole disks on tape, so as to store them in a convenient low volume form.

The backup on tape proceeds at 16 times the standard C64 speed (even faster than standard turbo tape format!) This means that the 175K of a 1541 disk drive are packed on only five minutes of tape.

Data is saved in three steps each of which saves approximately 60K of data, in track increasing order. All blocks are transferred, even free ones. This ensures that a disk copy will always fit the same length of tape, a useful feature if you want to rewrite updated data over an already existing copy. (However there is one exception – if blocks do not read properly, they are written in shortform so the entire copy will be shorter. It also means that it is not really worthwhile to use this program to save nearly empty disks.)

the program is made up of two complimentary parts: MCOPYTD and MCOPYDT. MCOPYTD saves data on tape and MCOPYDT reads it back to disk. These programs can also be used with the 1571 disk drive in 1541 mode. However only single sided disks or the first side of a double sided one can be saved with this version of the program. To use MCOPY, just RUN the two Basic programs (when keying these, don't forget the DATA 000,000... lines, since the checksum does not detect such omissions). Of course, since they are created on disk, a formatted disk must be in the drive.

Getting Started

Load MCOPYDT (disk to tape).
Make certain that you are past the leader of the tape.
Put the disk to be copied in the drive.
Run MCOPYDT: the introductory message appears.
Press record and play (the tape does not move yet).
Press RETURN. The program starts to read the disk, then transfers its contents on to tape in three steps. DO NOT stop the recorder between steps. When the process ends the message "END OF COPY" appears, along with error messages if needed. Note the tape counter value.

An error does not always mean that the whole copy is bad. However when the tape is reread the same error will be recreated on the new disk (also the copy on tape will be shorter). Therefore, it is up to the user to decide what to do when such an error occurs.

Reading Back

Load MCOPYTD (tape to disk).
Put a new disk in the drive.
Put a cassette into the datasette. Position tape to read the first of the three subsections previously saved. Reading over the end of other data does not matter since MCOPY only starts reading after having found a special synchronising header.
Run MCOPYTD
The read back proceeds in the same way as MCOPYDT, in three steps.

At the end of the process, the message "END OF COPY" appears. Remove the disk from drive (it doesn't matter if the red LED is still on, this is normal).

Two kinds of errors can arise during the readback process. Unfortunately, they are almost always fatal.

WRITE ERROR TRACK NN – means that the drive could not reread the data, it just writes on that track. This is usually caused by a bad disk. Try again with another one (see also TAPE LOADING ERROR).

TAPE LOADING ERROR – The cassette could not be read back properly.

This is usually caused by one of the following:

Bad tape; use only good quality cassettes. Although the encryption scheme used to write on tape is very reliable by itself, a singly false bit in the 60K*8 causes the error. I previously wrote these programs using standard turbo routines but an error occured nearly every time in one of the three sequences, it was also slower and the length of tape used was data dependent. 00 took less time to save than 'FF's.) Try to save 60K with standard turbo on the same tape you are very likely to see several errors, not just one.

Read head is dirty, clean it.

Read head has gone out of alignment since the tape was written, Realign it.

The recorder has been knocked or moved during read or write: this causes tape speed changes that can lead to errors.

The tape has been damaged, usually unrecoverable.

Too much friction inside cassette. Rewind it and retry.

You can (and it is recommended) leave blank space on tape between disks: to do that, just press the ↑ key and the recorder starts. Stop by pressing any other key. YC

```
MCOPYDT.CREATE

85  10 REM
5C  20 REM CREATES MCOPYDT ON DI
    SK
91  30 REM
53  40 REM FAST DISK TO TAPE BAC
    KUP PROGRAM
B9  50 REM SAVES UP TO 12 SINGLE
     SIDED DISKS
B3  60 REM
14  70 REM ON A SINGLE C60 CASSE
    TTE
DF  80 REM
23  90 REM WRITTEN BY J.LEBAILLY

EB  100 REM
36  110 OPEN2,8,2,"@0:MCOPYDT,P,
    W"
F5  120 PRINT#2,CHR$(1);CHR$(8);
```

```
16  130 PRINT"I CREATE 'MCOPYDT'
     ON DISK"
C8  140 CK=0:FORI=2049TO3994
E7  150 READ A:PRINT".";:PRINT#2
    ,CHR$(A);:CK=CK+A:NEXT
73  160 IF CK=181443 THEN CLOSE2
    :END
EA  170 PRINT"ERROR IN DATA: CHE
    CK PROGRAM"
48  180 CLOSE2:OPEN15,8,15,"S0:M
    COPYDT":CLOSE15
3E  190 END
19  200 DATA015,008,000,000,158,
    050,048,054
8D  210 DATA054,032,074,076,046,
    000,000,000
E2  220 DATA129,169,000,162,013,
    133,003,134
4D  230 DATA004,169,000,162,003,
    133,005,134
26  240 DATA006,169,008,032,177,
    255,169,111
22  250 DATA032,147,255,169,077,
    032,168,255
B3  260 DATA169,045,032,168,255,
    169,087,032
4F  270 DATA168,255,160,000,165,
    005,032,168
A7  280 DATA255,165,006,032,168,
    255,169,030
94  290 DATA032,168,255,177,003,
    032,168,255
71  300 DATA200,192,030,144,246,
    032,174,255
95  310 DATA024,165,003,105,030,
    133,003,144
EA  320 DATA003,230,004,024,165,
    005,166,006
2B  330 DATA105,030,133,005,144,
    002,230,006
71  340 DATA224,005,144,173,201,
    154,144,169
78  350 DATA169,008,032,177,255,
    169,111,032
48  360 DATA147,255,169,077,032,
    168,255,169
2C  370 DATA045,032,168,255,169,
    069,032,168
B2  380 DATA255,169,161,032,168,
    255,169,004
87  390 DATA032,168,255,032,174,
    255,169,004
A6  400 DATA133,255,032,111,011,
    147,017,032
27  410 DATA032,032,077,067,079,
    080,089,032
16  420 DATA067,066,077,032,054,
    052,032,045
B2  430 DATA032,086,067,032,049,
    053,052,049
01  440 DATA032,032,086,069,082,
    083,032,051
68  450 DATA046,049,013,013,032,
    032,032,068
E9  460 DATA073,083,075,032,084,
    079,032,084
1D  470 DATA065,080,069,032,066,
    065,067,075
47  480 DATA085,080,013,013,032,
    032,032,032
F0  490 DATA032,032,032,087,082,
    073,084,084
AC  500 DATA069,078,032,066,089,
    032,074,046
50  510 DATA076,069,066,065,073,
    076,076,089
C8  520 DATA013,013,032,032,073,
    078,083,069
36  530 DATA082,084,032,068,069,
    083,084,073
31  540 DATA078,065,084,073,079,
    078,032,084
AA  550 DATA065,080,069,013,032,
    073,078,083
51  560 DATA069,082,084,032,083,
    079,085,082
25  570 DATA067,069,032,068,073,
    083,075,013
F1  580 DATA032,032,032,032,080,
    082,069,083
6C  590 DATA083,032,065,078,089,
    032,075,069
6D  600 DATA089,013,000,032,031,
    011,198,255
36  610 DATA208,003,076,250,011,
    160,000,120
D6  620 DATA169,011,141,017,208,
    169,165,032
CB  630 DATA149,011,169,000,162,
    016,133,003
2A  640 DATA134,004,032,200,011,
    240,031,008
3D  650 DATA160,000,145,003,230,
    003,040,048
16  660 DATA012,032,200,011,145,
    003,200,208
3E  670 DATA248,230,004,208,229,
    041,031,170
A0  680 DATA202,134,006,076,183,
    010,032,200
D8  690 DATA011,016,007,041,063,
    133,005,076
4C  700 DATA099,009,032,248,010,
    032,056,248
9F  710 DATA162,000,032,096,011,
    169,020,133
13  720 DATA001,230,003,208,002,
    230,004,169
16  730 DATA001,133,185,169,000,
    133,172,169
52  740 DATA016,133,173,165,003,
    133,174,165
A1  750 DATA004,133,175,120,169,
    000,170,168
7F  760 DATA141,251,015,185,172,
    000,153,252
DF  770 DATA015,200,192,004,208,
    245,238,254
58  780 DATA015,208,003,238,255,
    015,169,251
33  790 DATA133,172,169,015,133,
    173,169,020
8F  800 DATA133,001,202,208,253,
    136,208,250
9D  810 DATA240,024,160,000,169,
    253,032,085
2A  820 DATA010,136,192,009,240,
    007,162,004
17  830 DATA202,208,253,240,239,
    230,163,198
91  840 DATA163,096,032,235,009,
    032,235,009
32  850 DATA032,235,009,234,234,
    234,234,152
77  860 DATA032,085,010,136,240,
    009,166,163
DE  870 DATA162,004,202,208,253,
    240,240,162
DD  880 DATA003,202,208,253,234,
    234,132,215
D9  890 DATA177,172,032,085,010,
    230,172,240
24  900 DATA005,166,172,076,057,
    010,230,173
82  910 DATA165,172,197,174,165,
    173,229,175
A6  920 DATA144,230,165,215,165,
    215,032,085
0B  930 DATA010,162,005,202,208,
    253,136,208
F6  940 DATA243,076,173,010,133,
    189,069,215
C7  950 DATA133,215,162,004,202,
    208,253,234
72  960 DATA234,169,008,133,163,
    006,189,176
17  970 DATA027,165,001,009,010,
    133,001,162
A7  980 DATA017,202,208,253,166,
    163,238,032
50  990 DATA208,198,163,041,212,
    133,001,165
5B  1000 DATA163,208,034,096,165
    ,001,041,247
EB  1010 DATA133,001,162,016,202
    ,208,253,166
27  1020 DATA163,009,002,133,001
    ,238,032,208
B3  1030 DATA198,163,041,220,009
    ,008,133,001
9F  1040 DATA165,163,208,001,096
    ,162,016,202
2B  1050 DATA208,253,240,185,162
    ,022,134,001
5C  1060 DATA032,248,010,076,071
    ,009,169,054
9F  1070 DATA133,001,032,111,011
    ,032,032,082
C7  1080 DATA069,065,068,032,069
    ,082,082,079
D9  1090 DATA082,032,033,032,032
    ,084,082,065
01  1100 DATA067,075,032,000,165
    ,005,032,002
FB  1110 DATA011,032,111,011,032
    ,083,069,067
8D  1120 DATA084,079,082,032,000
    ,165,006,032
A4  1130 DATA002,011,169,013,032
    ,210,255,120
84  1140 DATA169,052,133,001,076
    ,099,009,169
99  1150 DATA054,133,001,169,027
    ,141,017,208
2C  1160 DATA096,248,170,240,008
    ,169,000,024
7E  1170 DATA105,001,202,208,250
    ,216,072,074
F1  1180 DATA074,074,074,032,024
    ,011,104,041
0E  1190 DATA015,009,048,076,210
    ,255,120,032
AD  1200 DATA202,252,169,037,141
    ,015,212,169
1D  1210 DATA000,141,020,212,169
    ,043,141,019
93  1220 DATA212,169,047,141,024
    ,212,169,052
A2  1230 DATA141,023,212,169,032
    ,141,018,212
C6  1240 DATA169,033,141,018,212
    ,032,135,234
48  1250 DATA032,034,012,208,013
    ,173,028,212
25  1260 DATA073,089,141,022,212
    ,208,238,076
81  1270 DATA060,011,169,000,141
    ,018,212,169
6B  1280 DATA011,141,017,208,160
    ,032,202,208
D7  1290 DATA253,136,208,250,120
    ,096,104,133
E5  1300 DATA053,104,133,054,160
    ,000,230,053
81  1310 DATA208,002,230,054,177
    ,053,240,011
A5  1320 DATA032,210,255,230,053
    ,208,245,230
38  1330 DATA054,208,241,230,053
    ,208,002,230
EF  1340 DATA054,108,053,000,133
    ,107,169,053
26  1350 DATA133,001,169,011,141
    ,000,221,173
65  1360 DATA000,221,016,251,169
    ,003,141,000
FD  1370 DATA221,162,004,169,003
    ,070,107,106
CA  1380 DATA070,107,106,074,074
    ,009,003,141
70  1390 DATA000,221,202,208,238
    ,162,001,202
1E  1400 DATA208,253,169,052,133
    ,001,096,169
AF  1410 DATA053,133,001,169,011
    ,141,000,221
32  1420 DATA173,000,221,016,251
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    ,169,003,141
AD  1430 DATA000,221,162,005,202
    ,234,208,252
1B  1440 DATA162,004,173,000,221
    ,010,008,010
C2  1450 DATA038,107,040,038,107
    ,202,208,242
07  1460 DATA169,052,133,001,165
    ,107,073,255
EF  1470 DATA096,032,248,010,032
    ,111,011,013
22  1480 DATA017,032,032,062,062
    ,062,032,069
B5  1490 DATA078,068,032,079,070
    ,032,067,079
4C  1500 DATA080,089,032,060,060
    ,060,013,000
51  1510 DATA032,031,011,032,248
    ,010,076,159
AB  1520 DATA008,032,228,255,201
    ,094,208,008
FA  1530 DATA165,001,073,032,133
    ,001,169,000
4D  1540 DATA009,000,096,000,000
    ,000,000,000
BB  1550 DATA000,000,000,000,000
    ,000,000,000
B1  1560 DATA000,000,000,000,000
    ,000,000,000
87  1570 DATA000,000,000,000,000
    ,000,000,000
9D  1580 DATA000,000,000,000,000
    ,000,000,000
93  1590 DATA000,000,000,000,000
    ,000,000,000
E9  1600 DATA000,000,000,000,000
    ,000,000,000
FF  1610 DATA000,000,000,000,000
    ,000,000,000
F5  1620 DATA000,000,000,000,000
    ,000,000,000
CB  1630 DATA000,000,000,000,000
    ,000,000,000
C1  1640 DATA000,000,000,000,000
    ,000,000,000
D7  1650 DATA000,000,000,000,000
    ,000,000,000
2D  1660 DATA000,000,000,000,000
    ,000,000,000
23  1670 DATA000,000,000,000,000
    ,000,000,000
39  1680 DATA000,000,000,000,000
    ,000,000,000
0F  1690 DATA000,000,000,000,000
    ,000,000,000
05  1700 DATA000,000,000,000,000
    ,000,000,000
1B  1710 DATA000,000,000,000,000
    ,000,000,000
11  1720 DATA000,000,000,000,000
    ,000,000,000
67  1730 DATA000,000,000,000,000
    ,000,000,000
7D  1740 DATA000,000,000,000,000
    ,000,000,000
73  1750 DATA000,000,000,000,000
    ,000,000,000
49  1760 DATA000,000,000,000,000
    ,000,000,000
5F  1770 DATA000,000,000,000,000
    ,000,000,000
55  1780 DATA000,000,000,000,000
    ,000,000,000
AF  1790 DATA000,000,000,000,000
    ,000,000,165
E0  1800 DATA000,041,006,240,004
    ,201,002,240
FC  1810 DATA003,076,158,253,165
    ,068,074,074
A9  1820 DATA074,074,074,170,189
    ,061,004,133
2E  1830 DATA012,165,119,208,004
    ,230,119,165
E1  1840 DATA067,133,010,169,015
    ,133,009,169
5D  1850 DATA090,133,075,169,082
    ,133,036,032
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F5  1860 DATA086,245,080,254,184
    ,173,001,028
4D  1870 DATA197,036,240,009,198
    ,075,208,239
16  1880 DATA169,010,076,105,249
    ,162,000,080
CD  1890 DATA254,184,173,001,028
    ,149,037,232
9F  1900 DATA224,007,144,243,032
    ,151,244,165
F8  1910 DATA022;069,023,069,024
    ,069,025,069
51  1920 DATA026,240,007,198,009
    ,208,192,076
85  1930 DATA030,244,165,024,197
    ,006,240,003
32  1940 DATA076,011,244,133,034
    ,165,022,166
F4  1950 DATA023,133,018,134,019
    ,166,025,232
14  1960 DATA232,228,067,144,002
    ,162,000,169
16  1970 DATA007,133,049,076,048
    ,004,202,208
F1  1980 DATA021,076,012,004,134
    ,007,134,025
35  1990 DATA138,069,024,069,023
    ,069,022,133
84  2000 DATA026,032,052,249,162
    ,090,032,086
49  2010 DATA245,080,254,184,173
    ,001,028,217
8E  2020 DATA036,000,208,218,200
    ,192,008,208
E3  2030 DATA240,032,086,245,080
    ,254,184,173
57  2040 DATA001,028,145,048,200
    ,208,245,160
53  2050 DATA186,080,254,184,173
    ,001,028,153
29  2060 DATA000,001,200,208,244
    ,032,224,248
31  2070 DATA165,056,197,071,208
    ,045,032,233
92  2080 DATA245,197,058,240,011
    ,166,007,189
87  2090 DATA080,001,208,035,169
    ,005,208,033
02  2100 DATA230,025,165,025,032
    ,065,004,185
ED  2110 DATA000,007,032,065,004
    ,200,208,247
02  2120 DATA173,000,028,073,008
    ,141,000,028
7A  2130 DATA169,255,044,169,132
    ,166,007,009
82  2140 DATA128,157,080,001,008
    ,160,000,140
69  2150 DATA254,002,040,016,007
    ,198,010,208
CA  2160 DATA003,076,158,253,138
    ,024,101,012
EB  2170 DATA197,067,144,002,229
    ,067,170,189
33  2180 DATA080,001,016,005,232
    ,138,076,041
3C  2190 DATA004,076,149,003,009
    ,009,010,011
09  2200 DATA133,008,044,000,024
    ,016,251,169
0C  2210 DATA016,141,000,024,044
    ,000,024,048
DA  2220 DATA251,162,004,169,000
    ,006,008,042
0D  2230 DATA010,006,008,042,010
    ,141,000,024
EB  2240 DATA202,208,240,162,001
    ,202,208,000
EA  2250 DATA234,234,169,015,141
    ,000,024,096
CB  2260 DATA044,000,024,016,251
    ,169,016,141
4C  2270 DATA000,024,044,000,024
    ,048,251,162
53  2280 DATA004,202,208,253,142
    ,000,024,162
55  2290 DATA004,173,000,024,074
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    ,008,074,074
A2  2300 DATA102,008,040,102,008
    ,202,208,241
61  2310 DATA169,015,141,000,024
    ,165,008,096
B8  2320 DATA120,169,007,133,071
    ,162,000,202
8E  2330 DATA208,253,169,001,133
    ,006,169,224
38  2340 DATA032,144,005,032,113
    ,004,169,000
93  2350 DATA032,065,004,165,006
    ,009,128,032
EB  2360 DATA065,004,032,133,005
    ,169,000,133
73  2370 DATA120,133,131,133,119
    ,133,016,169
F3  2380 DATA226,032,144,005,201
    ,002,144,017
71  2390 DATA165,016,208,013,169
    ,176,032,144
8E  2400 DATA005,230,016,169,000
    ,133,120,133
C2  2410 DATA131,162,000,134,009
    ,189,080,001
99  2420 DATA201,255,208,008,232
    ,228,067,208
B6  2430 DATA244,076,028,005,164
    ,120,185,219
46  2440 DATA254,240,010,169,000
    ,157,080,001
24  2450 DATA230,009,076,245,004
    ,134,007,232
38  2460 DATA138,009,128,032,065
    ,004,166,007
BB  2470 DATA076,245,004,165,009
    ,240,025,133
F4  2480 DATA119,165,131,056,249
    ,219,254,133
E6  2490 DATA131,185,219,254,088
    ,133,123,032
AB  2500 DATA118,214,120,230,120
    ,076,208,004
5C  2510 DATA165,131,088,032,118
    ,214,120,169
43  2520 DATA000,133,123,230,006
    ,165,006,201
32  2530 DATA012,240,015,201,023
    ,240,011,201
62  2540 DATA036,240,003,076,183
    ,004,169,001
29  2550 DATA133,006,169,000,032
    ,065,004,169
1A  2560 DATA001,032,065,004,173
    ,000,028,041
C2  2570 DATA251,141,000,028,032
    ,113,004,173
AD  2580 DATA000,028,009,004,141
    ,000,028,162
39  2590 DATA000,202,208,253,169
    ,224,032,144
DE  2600 DATA005,076,183,004,169
    ,000,162,020
1F  2610 DATA157,080,001,202,016
    ,250,096,133
F4  2620 DATA000,088,165,000,048
    ,252,120,096
FF  2630 DATA000,000,000,000,000
    ,000,000,000
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PROGRAM:MCOPYTD.CREATE

```
B5  10 REM
9B  20 REM
2E  30 REM CREATES MCOPYTD ON DI
    SK
16  40 REM FAST READ BACK PROGRA
    M
09  50 REM FROM CASSETTE TO DISK

B3  60 REM
2A  70 REM COMPLEMENTARY TO MCOP
    YDT
DF  80 REM
23  90 REM WRITTEN BY J.LEBAILLY
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```
EB  100 REM
D6  110 OPEN2,8,2,"@0:MCOPYTD,P,
    W"
F5  120 PRINT#2,CHR$(1);CHR$(8);
36  130 PRINT"I CREATE 'MCOPYTD'
     ON DISK"
CB  140 CK=0:FORI=2049TO4113
E7  150 READ A:PRINT".";:PRINT#2
    ,CHR$(A);:CK=CK+A:NEXT
DB  160 IF CK=193655 THEN CLOSE2
    :END
EA  170 PRINT"ERROR IN DATA: CHE
    CK PROGRAM"
48  180 CLOSE2:OPEN15,8,15,"S0:M
    COPYTD":CLOSE15
3E  190 END
19  200 DATA015,008,000,000,158,
    050,048,054
B9  210 DATA054,032,074,046,076,
    000,000,000
E2  220 DATA129,169,000,162,013,
    133,003,134
4D  230 DATA004,169,000,162,003,
    133,005,134
26  240 DATA006,169,008,032,177,
    255,169,111
22  250 DATA032,147,255,169,077,
    032,168,255
B3  260 DATA169,045,032,168,255,
    169,087,032
4F  270 DATA168,255,160,000,165,
    005,032,168
A7  280 DATA255,165,006,032,168,
    255,169,030
94  290 DATA032,168,255,177,003,
    032,168,255
71  300 DATA200,192,030,144,246,
    032,174,255
95  310 DATA024,165,003,105,030,
    133,003,144
EA  320 DATA003,230,004,024,165,
    005,166,006
2B  330 DATA105,030,133,005,144,
    002,230,006
16  340 DATA224,006,144,173,201,
    017,144,169
78  350 DATA169,008,032,177,255,
    169,111,032
48  360 DATA147,255,169,077,032,
    168,255,169
2C  370 DATA045,032,168,255,169,
    069,032,168
82  380 DATA255,169,056,032,168,
    255,169,005
35  390 DATA032,168,255,032,174,
    255,032,113
CB  400 DATA011,147,013,032,032,
    032,070,067
60  410 DATA079,080,089,032,067,
    066,077,032
03  420 DATA054,052,032,045,032,
    086,067,032
4B  430 DATA049,053,052,049,032,
    086,069,082
DC  440 DATA083,032,051,046,048,
    013,032,032
99  450 DATA032,082,069,065,068,
    032,066,065
2A  460 DATA067,075,085,080,032,
    084,065,080
79  470 DATA069,032,080,082,079,
    071,082,065
45  480 DATA077,013,013,032,032,
    032,032,032
F4  490 DATA032,032,087,082,073,
    084,084,069
6B  500 DATA078,032,066,089,032,
    074,046,076
07  510 DATA069,066,065,073,076,
    076,089,013
EF  520 DATA013,032,073,078,083,
    069,082,084
27  530 DATA032,083,079,085,082,
    067,069,032
4E  540 DATA084,065,080,069,032,
    038,032,068
F9  550 DATA069,083,084,073,078,
    065,084,073
AA  560 DATA079,078,032,068,073,
    083,075,013
94  570 DATA000,032,034,011,032,
    251,010,032
BD  580 DATA023,248,120,162,000,
    134,147,160
84  590 DATA000,132,215,032,080,
    009,032,099
6E  600 DATA009,165,215,133,144,
    240,004,169
B9  610 DATA255,133,144,024,076,
    054,010,160
37  620 DATA000,173,017,208,041,
    239,141,017
D4  630 DATA208,162,000,160,000,
    169,022,133
24  640 DATA001,096,169,255,133,
    254,141,254
89  650 DATA015,141,255,015,169,
    251,133,195
EE  660 DATA169,015,133,196,169,
    255,141,006
C1  670 DATA221,169,001,141,007,
    221,044,013
04  680 DATA220,169,016,044,013,
    220,240,251
0C  690 DATA169,025,141,015,221,
    169,016,044
6C  700 DATA013,220,240,251,173,
    007,221,174
DF  710 DATA006,221,072,169,025,
    141,015,221
7D  720 DATA104,240,007,056,032,
    208,009,076
2B  730 DATA142,009,024,032,208,
    009,224,152
59  740 DATA048,241,024,032,208,
    009,169,016
60  750 DATA044,013,220,240,251,
    173,007,221
B8  760 DATA174,006,221,072,169,
    025,141,015
BE  770 DATA221,104,240,215,076,
    179,009,038
93  780 DATA189,238,032,208,165,
    254,208,046
FD  790 DATA198,163,240,001,096,
    169,008,133
42  800 DATA163,169,020,133,001,
    165,189,145
24  810 DATA195,069,215,133,215,
    169,022,133
96  820 DATA001,230,195,208,002,
    230,196,165
99  830 DATA195,205,254,015,165,
    196,237,255
71  840 DATA015,144,217,104,104,
    096,016,019
B5  850 DATA169,255,133,254,165,
    189,201,253
DD  860 DATA208,008,169,009,133,
    254,169,008
2A  870 DATA133,163,096,198,163,
    208,251,169
C8  880 DATA008,133,163,165,189,
    201,253,240
D2  890 DATA241,197,254,208,003,
    198,254,096
B1  900 DATA169,255,133,254,096,
    234,165,144
A3  910 DATA240,003,032,202,010,
    032,098,011
4E  920 DATA032,151,011,169,000,
    133,003,169
04  930 DATA016,133,004,160,000,
    032,202,011
AD  940 DATA208,023,177,003,008,
    032,151,011
E1  950 DATA230,003,040,048,240,
    177,003,032
F4  960 DATA151,011,200,208,248,
    230,004,208
2B  970 DATA228,016,015,041,063,
    133,005,165
3F  980 DATA003,166,004,133,048,
    134,049,076
E5  990 DATA078,010,201,003,208,
    006,032,251
2A  1000 DATA010,076,045,009,201
    ,009,208,011
26  1010 DATA165,048,166,049,133
    ,003,134,004
65  1020 DATA076,078,010,201,036
    ,208,003,076
48  1030 DATA252,011,032,251,010
    ,032,113,011
44  1040 DATA013,032,042,042,042
    ,042,042,042
BB  1050 DATA042,042,042,032,087
    ,082,073,084
DD  1060 DATA069,032,069,082,082
    ,079,082,032
5F  1070 DATA033,032,084,082,065
    ,067,075,032
8C  1080 DATA000,165,005,032,005
    ,011,076,252
CA  1090 DATA011,169,054,133,001
    ,032,113,011
08  1100 DATA032,042,042,042,042
    ,042,042,042
BC  1110 DATA042,032,084,065,080
    ,069,032,076
07  1120 DATA079,065,068,073,078
    ,071,032,069
7A  1130 DATA082,082,079,082,032
    ,033,000,169
FE  1140 DATA013,032,210,255,120
    ,169,052,133
5F  1150 DATA001,096,169,054,133
    ,001,169,027
90  1160 DATA141,017,208,096,248
    ,170,240,008
37  1170 DATA169,000,024,105,001
    ,202,208,250
17  1180 DATA216,072,074,074,074
    ,074,032,027
06  1190 DATA011,104,041,015,009
    ,048,076,210
04  1200 DATA255,120,032,202,252
    ,169,037,141
15  1210 DATA015,212,169,000,141
    ,020,212,169
12  1220 DATA043,141,019,212,169
    ,047,141,024
6E  1230 DATA212,169,052,141,023
    ,212,169,032
47  1240 DATA141,018,212,169,033
    ,141,018,212
1C  1250 DATA032,135,234,032,228
    ,255,208,012
0D  1260 DATA173,028,212,073,089
    ,141,022,212
31  1270 DATA208,238,240,226,169
    ,000,141,018
45  1280 DATA212,169,011,141,017
    ,208,160,032
EF  1290 DATA202,208,253,136,208
    ,250,120,096
B6  1300 DATA104,133,053,104,133
    ,054,160,000
DA  1310 DATA230,053,208,002,230
    ,054,177,053
A1  1320 DATA240,011,032,210,255
    ,230,053,208
B1  1330 DATA245,230,054,208,241
    ,230,053,208
76  1340 DATA002,230,054,108,053
    ,000,133,107
96  1350 DATA169,053,133,001,169
    ,011,141,000
2F  1360 DATA221,173,000,221,016
    ,251,169,003
84  1370 DATA141,000,221,162,004
    ,169,003,070
92  1380 DATA107,106,070,107,106
    ,074,074,009
C2  1390 DATA003,141,000,221,202
    ,208,238,162
CC  1400 DATA001,202,208,253,169
    ,052,133,001
D3  1410 DATA096,169,053,133,001
    ,169,011,141
C8  1420 DATA000,221,173,000,221
    ,016,251,169
81  1430 DATA003,141,000,221,162
    ,005,202,234
31  1440 DATA208,252,162,004,173
    ,000,221,010
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81   1450 DATA008,010,038,107,040
     ,038,107,202
0B   1460 DATA208,242,169,052,133
     ,001,165,107
EB   1470 DATA073,255,096,032,251
     ,010,032,113
ED   1480 DATA011,013,032,032,062
     ,062,062,032
F0   1490 DATA069,078,068,032,079
     ,070,032,067
00   1500 DATA079,080,089,032,060
     ,060,060,013
4B   1510 DATA000,032,034,011,032
     ,251,010,076
5F   1520 DATA159,008,000,000,000
     ,000,000,000
50   1530 DATA000,000,000,000,000
     ,000,000,000
A5   1540 DATA000,000,000,000,000
     ,000,000,000
BB   1550 DATA000,000,000,000,000
     ,000,000,000
B1   1560 DATA000,000,000,000,000
     ,000,000,000
87   1570 DATA000,000,000,000,000
     ,000,000,000
9D   1580 DATA000,000,000,000,000
     ,000,000,000
93   1590 DATA000,000,000,000,000
     ,000,000,000
E9   1600 DATA000,000,000,000,000
     ,000,000,000
FF   1610 DATA000,000,000,000,000
     ,000,000,000
F5   1620 DATA000,000,000,000,000
     ,000,000,000
CB   1630 DATA000,000,000,000,000
     ,000,000,000
C1   1640 DATA000,000,000,000,000
     ,000,000,000
D7   1650 DATA000,000,000,000,000
     ,000,000,000
2D   1660 DATA000,000,000,000,000
     ,000,000,000
23   1670 DATA000,000,000,000,000
     ,000,000,000
39   1680 DATA000,000,000,000,000
     ,000,000,000
0F   1690 DATA000,000,000,000,000
     ,000,000,000
05   1700 DATA000,000,000,000,000
     ,000,000,000
1B   1710 DATA000,000,000,000,000
     ,000,000,000
11   1720 DATA000,000,000,000,000
     ,000,000,000
67   1730 DATA000,000,000,000,000
     ,000,000,000
7D   1740 DATA000,000,000,000,000
     ,000,000,000
73   1750 DATA000,000,000,000,000
     ,000,000,000
49   1760 DATA000,000,000,000,000
     ,000,000,000
5F   1770 DATA000,000,000,000,000
     ,000,000,000
55   1780 DATA000,000,000,000,000
     ,000,000,000
AF   1790 DATA000,000,000,000,000
     ,000,000,165
06   1800 DATA000,041,006,240,017
     ,201,002,208
58   1810 DATA003,076,023,003,201
     ,004,208,003
B8   1820 DATA076,150,004,076,026
     ,003,076,158
85   1830 DATA253,165,068,074,074
     ,074,074,074
25   1840 DATA170,189,143,004,133
     ,012,160,000
EF   1850 DATA132,010,162,000,165
     ,057,153,000
00   1860 DATA007,200,200,165,010
     ,153,000,007
FE   1870 DATA200,165,006,153,000
     ,007,200,165
BC   1880 DATA019,153,000,007,200
     ,165,018,153
C3   1890 DATA000,007,200,169,015
     ,153,000,007
F9   1900 DATA200,153,000,007,200
     ,185,250,006
DA   1910 DATA089,251,006,089,252
     ,006,089,253
4F   1920 DATA006,153,249,006,230
     ,010,165,010
BD   1930 DATA197,067,144,192,152
     ,072,169,007
5C   1940 DATA133,049,032,048,254
     ,104,168,136
0C   1950 DATA185,000,007,153,069
     ,007,136,208
E6   1960 DATA247,173,000,007,141
     ,069,007,032
0F   1970 DATA245,253,169,000,133
     ,050,173,012
1F   1980 DATA028,041,031,009,192
     ,141,012,028
08   1990 DATA169,255,141,003,028
     ,169,085,141
14   2000 DATA001,028,162,030,032
     ,036,254,169
62   2010 DATA255,141,001,028,162
     ,005,080,254
FA   2020 DATA184,202,208,250,162
     ,010,164,050
5E   2030 DATA080,254,184,185,000
     ,007,141,001
AD   2040 DATA028,200,202,208,243
     ,162,009,080
49   2050 DATA254,184,169,085,141
     ,001,028,202
3D   2060 DATA208,245,169,255,162
     ,005,080,254
06   2070 DATA184,141,001,028,202
     ,208,247,169
3E   2080 DATA085,080,254,184,141
     ,001,028,162
86   2090 DATA188,080,254,184,169
     ,221,141,001
41   2100 DATA028,232,208,245,160
     ,000,080,254
AE   2110 DATA184,169,221,141,001
     ,028,136,208
89   2120 DATA245,169,085,166,012
     ,080,254,184
AC   2130 DATA141,001,028,202,208
     ,247,165,050
B9   2140 DATA024,105,010,133,050
     ,198,010,208
CD   2150 DATA142,080,254,184,080
     ,254,184,032
92   2160 DATA000,254,169,000,141
     ,254,002,133
1D   2170 DATA080,169,001,076,105
     ,249,133,008
BB   2180 DATA044,000,024,016,251
     ,169,016,141
3C   2190 DATA000,024,044,000,024
     ,048,251,162
1C   2200 DATA004,169,000,006,008
     ,042,010,006
4C   2210 DATA008,042,010,141,000
     ,024,202,208
0D   2220 DATA240,162,001,202,208
     ,000,234,234
16   2230 DATA169,015,141,000,024
     ,096,044,000
69   2240 DATA024,016,251,169,016
     ,141,000,024
7A   2250 DATA044,000,024,048,251
     ,162,004,202
FE   2260 DATA208,253,142,000,024
     ,162,004,173
4F   2270 DATA000,024,074,008,074
     ,074,102,008
FF   2280 DATA040,102,008,202,208
     ,241,169,015
4C   2290 DATA141,000,024,165,008
     ,096,008,011
93   2300 DATA016,007,076,046,005
     ,165,067,133
61   2310 DATA010,032,000,254,169
     ,000,032,047
B0   2320 DATA004,234,032,095,004
     ,048,235,170
3D   2330 DATA202,134,007,169,007
     ,133,049,160
BD   2340 DATA000,032,095,004,153
     ,000,007,200
94   2350 DATA208,247,032,233,245
     ,133,058,032
59   2360 DATA143,247,173,254,002
     ,133,124,169
A4   2370 DATA000,141,254,002,133
     ,080,165,015
02   2380 DATA240,003,076,222,005
     ,032,016,245
F7   2390 DATA162,009,080,254,184
     ,202,208,250
75   2400 DATA169,255,141,003,028
     ,173,012,028
F9   2410 DATA041,031,009,192,141
     ,012,028,169
E2   2420 DATA255,162,005,141,001
     ,028,184,080
56   2430 DATA254,184,202,208,250
     ,160,187,185
06   2440 DATA000,001,080,254,184
     ,141,001,028
D6   2450 DATA200,208,244,165,124
     ,141,254,002
3E   2460 DATA177,048,080,254,184
     ,141,001,028
0E   2470 DATA200,208,245,080,254
     ,032,000,254
15   2480 DATA173,000,028,073,008
     ,141,000,028
16   2490 DATA169,000,141,254,002
     ,198,010,240
F7   2500 DATA003,076,157,004,076
     ,158,253,120
F5   2510 DATA169,007,133,071,162
     ,000,202,208
65   2520 DATA253,169,001,133,006
     ,173,000,028
F0   2530 DATA041,251,141,000,028
     ,032,095,004
EA   2540 DATA173,000,028,009,004
     ,141,000,028
1C   2550 DATA162,000,202,208,253
     ,165,006,201
3B   2560 DATA001,208,005,169,192
     ,032,213,005
3C   2570 DATA169,224,032,213,005
     ,165,006,009
D9   2580 DATA128,032,047,004,169
     ,005,133,014
50   2590 DATA169,009,032,047,004
     ,169,230,032
97   2600 DATA213,005,169,228,162
     ,000,134,015
65   2610 DATA032,213,005,201,002
     ,176,016,169
DF   2620 DATA009,032,047,004,230
     ,015,169,228
98   2630 DATA032,213,005,201,002
     ,144,009,198
CB   2640 DATA014,208,213,169,005
     ,076,196,005
DA   2650 DATA230,006,165,006,201
     ,012,240,011
98   2660 DATA201,023,240,007,201
     ,036,240,011
C6   2670 DATA076,110,005,169,003
     ,032,047,004
DC   2680 DATA076,070,005,032,047
     ,004,076,061
71   2690 DATA005,169,000,162,020
     ,157,080,001
98   2700 DATA202,016,250,096,133
     ,000,088,165
89   2710 DATA000,048,252,120,096
     ,032,010,245
15   2720 DATA160,187,185,000,001
     ,080,254,184
CC   2730 DATA077,001,028,208,026
     ,200,208,242
D2   2740 DATA165,124,141,254,002
     ,177,048,080
DC   2750 DATA254,184,077,001,028
     ,208,008,200
FB   2760 DATA192,253,208,241,076
     ,033,005,169
1E   2770 DATA000,141,254,002,076
     ,197,246,000
49   2780 DATA000,000
```

Letters

The page in Your Commodore written by our readers for our readers.

Neglected C16

I am writing with reference to R. Jones's letter in the November issue of *Your Commodore*.

R. Jones wrote regarding the lack of magazines for the C16. I buy two Commodore magazines, one of which is *Your Commodore* Both give the C16 a fair chance but if you buy any magazine you should expect it to be dominated with articles for the C64.

There is a magazine available which caters for just the C16 and Plus/4 but it is only obtainable by mail order subscription. The fee is £10 (£15 overseas) and it features reviews of hardware and software. Club members are allowed free classified ads and club mailings throughout the year. It's a monthly magazine so that's not bad for a tenner is it? Cheques, postal orders or international money orders should be sent to: Micro C16/Plus 4 User Club, (20 User), Micro Media, 42 Mount Stewart St, Carluke, Lanarkshire ML8 5EB.

Also, if any C16 Plus/4 owners are interested in user defined character sets they can send me an SAE and I will send a copy on tape.

H Jenkins, 27 College Glade, Caerleon, Gwent NP6 1TE.

Nationwide Club

Perhaps *Your Commodore* would be interested to know about the recent formation of The National Computer Club. As Mr Humphrey pointed out in November's mailbag, other magazines have moved towards game playing and away from real computing. Unfortunately, localised computer clubs have, all too often, done the same thing. Consequently, computer hobbyists have tended to drift away and their expertise has gone with them. This has left large numbers of enthusiasts without the personal contact with other enthusiasts that progression and development of ideas needs.

The National Computer Club (NCC) is seeking to fill the gap by providing all the benefits of a local computing club but on a nationwide scale, giving members the benefit of personal contact with a large pool of knowledge, expertise and experience.

Our aim is to produce an environment, within the club, where members can contact one another to find solutions to problems, answers to queries or to form computing relationships with other, like-minded, members.

The club caters for all levels of expertise from beginners to experts and for all machines – even home built. This is important because we view computing as 'computing' and not 'Spectruming', 'Commodore 64ing' or even 'Beebing'. No disrespect intended since most of us limit our computing to just one machine, but interests, within the overall term 'computing', range from Basic programming right through to machine building and a great deal of information and programming (with modifications) is applicable to all machines. e.g. address decoding, machine code flow charts, etc.

The NCC is a 'computing' club and therefore caters for all computing interests. Of course a Commodore user, thinking of buying a particular program, might want to hear the views of others who already have the program. In the NCC he can ask them. I should add that the excellent hobby of games writing is a part of the NCC, but games playing, on its own, is not. However, players who wish to move into computing are very welcome.

The way that members make contact with otherw whether for help or for computing relationships is through our monthly bulletin which is for the free use of members. Included in it are: sales, wants, queries (could be difficulties or general interest), general projects, items of interest such as utility routines, techniques, etc, and whatever else the members would like to say. For instance somebody might need the pin-out of a particular logic chip. He could aks for it in the bulletin and other members who just happen to have that information would send it directly to him. He might also have stated what he is doing, etc and asked for others who are doing the same to get in touch for the sharing of information and mutual progression.

Finally, for a mere SAE, I would be pleased to send further details of the NCC to any of your readers.

Philip Craven, NCC, 212 Dudley Hill Road, Bradford BD2 3DF.

International Club

I am a reader of *Your Commodore* and I have founded, with two other people, a Commodore user club for C64 and C128 owners (disk drive only).

We have approximately 20 members in Switzerland, France, Belgium and one in Norway. We would like to get in touch with users in the UK and USA. If any *Your Commodore* readers are interested we would be very pleased to hear from them. We would also like to hear from other Commodore computer clubs.

F. Stiffan, Interclub Geneve, 78 Rue de St Jean, 1201 Geneva, Switzerland.

Giveaway Success

I very rarely write a letter to a computer magazine, but I think *Your Commodore* deserves one. Firstly because of the free tape you supplied with the November issue.

The game R1 D1 was brilliant, great graphics, good sound and very addictive gameplay. It was better than a lot of games I have bought from the shops. I think the author of the game, Tony Crowther deserves a lot of credit.

May I also thank you for including information and software for the C128, as I have recently bought a Commodore 128. *Your Commodore* seems to be the only magazine with sufficient coverage of this computer.

Well done, thank you for a fabulous magazine.

Paul Newport, Bristol.


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Peter Shilton's



Spectrum, CBM64,
Amstrad: £6.95

Victory House, Leicester Place,
London WC2H 7NB.
Telephone: 01-439 0666

GRANDSLAM

Can you save the day?

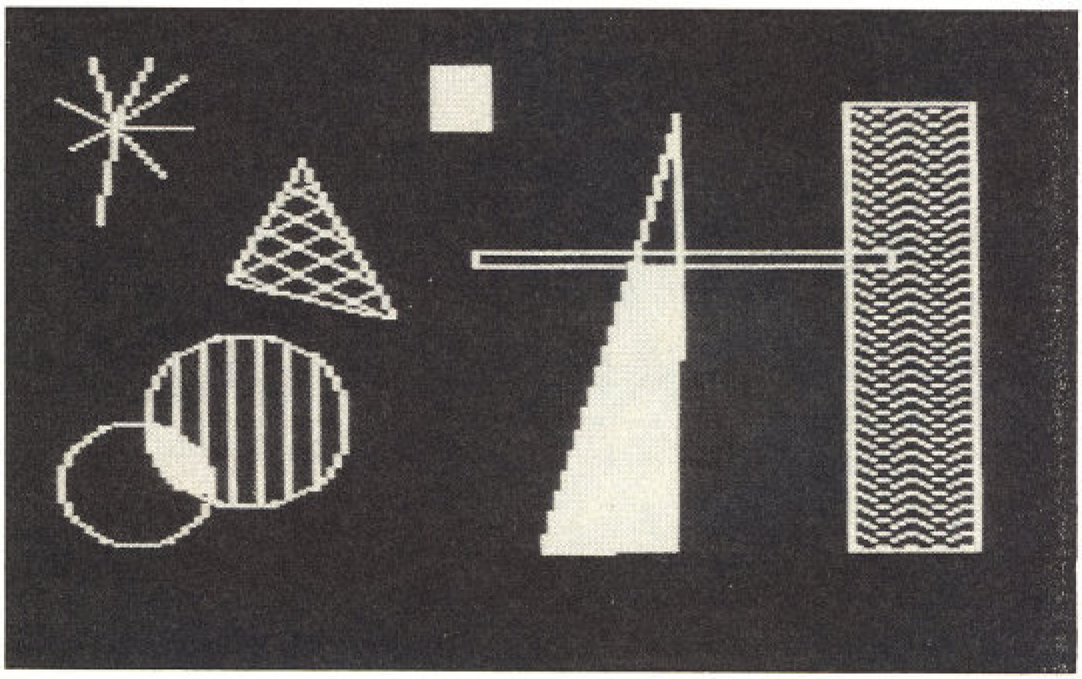
Two or multi-player option, training mode, league tables. ALL THE ACTION!

Making Light Work

C16 and Plus/4 owners should read on to find out just how good is the Trojan lightpen for the computer.

By Gordon Hamlett

Budding Picassos everywhere can now create their own designs on their computers. The CAD-Master pack (CAD = Computer Aided Design) for the C16 and Plus/4 machines is a light pen based system and comes complete with menu driven software and special adaptor. Setting up the system is very straightforward. The adaptor plugs into the joystick port and converts the non-standard circular Commodore port into the more normal D-type socket. There are two versions of the program – one for each machine so it is necessary to make sure that you load in the correct one – especially as the Plus/4 will load both and there is a considerable difference in the number of functions available. The reivew will concentrate on the Plus/4 version unless otherwise specified.

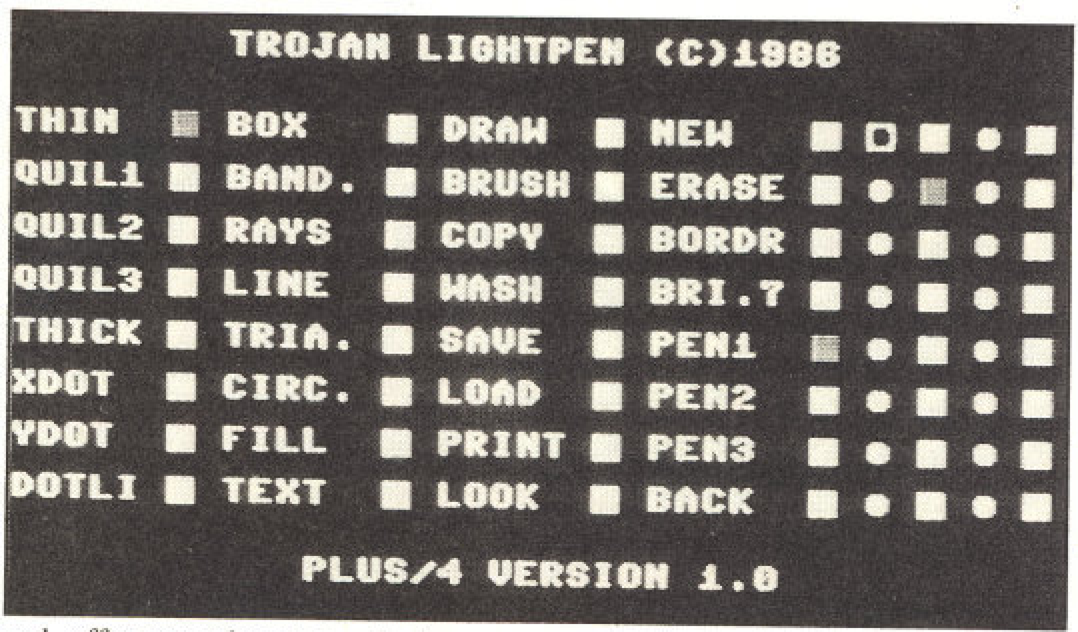


After loading, you are presented with a menu screen detailing the different shapes, pen widths and colours available to you. Selecting an option is simply a case of pointing the light pen to the appropriate area of the screen. You can draw on screen in a variety of styles. Thick and thin lines, solid or dotted and three different thicknesses of italic. Drawing freehand is horribly slow and pernickety and takes considerable practice to master. Any joystick or trackball system could beat the light pen hands down. Shape drawing is considerably easier. Select the shape or pattern from the menu – you can select from boxes, banding, rays, lines, triangles and circles. Position the light pen in the approximate position on the screen where you want the shape and press the control key. The screen flashes and a dot appears where your light pen was. This can now be finely adjusted using the cursor keys and the process repeated for, say, the other two points of the traingle.

Areas of your design can be copied elsewhere on the screen, doubling either or both of height and width if required. Areas of the screen can be filled in with different colours although care should be taken that the design does not 'leak' – the area must be enclosed by solid lines. There is an erase function if you do make a mistake. Judicious use of the three available pens and the wash function should be made in order to avoid colour clashes in intersections of lines and shapes. Text can also be included in your pictures should you wish to caption them.

Having considerably less memory to play with, the C16 version is written in only 2K. Naturally, there is no room for certain functions and the ones omitted were the freehand drawing and associated options such as italics etc. One feature not included in the Plus/4 version is the ability to draw either a circle or an ellipse. The manual, which is generally poor, is decidedly dreadful here. Apart from

insisting on calling ellipses eclipses! There is also the following piece of waffle. Having positioned the centre of the circle, 'the second point selected in the CIRCLE must be at 45 degrees to the first point or an ECLIPSE (sic) will be draw'. The problem is that two points can never be at an angle to each other – they are joined by a straight line so the above is nonsensical. What I think they meant to say was that if you imagine a vertical line drawn through the first dot, then the second dot can subtend an angle of 45 degrees to that line. In other words, if north is at the top of the screen, then you get a circle if the second dot is at NW, NE, SE or SW. Anywhere else results in an ellipse.



Using the light pen itself, is an acquired art. You don't need to apply pressure but you do have to ensure that the pen is flush with the screen – not always easy with a curved screen. My own personal experience is that they are unwieldy and cumbersome to use and offer no advantage whatsoever over traditional graphic packages. The advent of the mouse or even the humble joystick has all but killed their use for computer applications. It is only as bar code readers have they found any great commercial value. Poor documentation and software (the program crashed on me half way through a picture with array problems) mean that this package cannot be recommended. YC

Touchline

Company: *Computer Cupboard, Freepost, London W5 1BR.* ***Price:*** *£19.95*

Listings

Get it right first time with our deluxe program system for the C64.

You may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. Fret no more, it's all part of our easy entry aid.

Instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of these symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C+2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:
[CTRL N, DOWN2,LEFT5,BLUE, F3,C3]

This would be achieved by holding down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLUE while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2 would of course make the computer print in brown).

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:
[SS],[C*]
In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string: the symbol for pi. This may appear when its value is needed in a calculation so this may look something like:
:CC=2*[PI]*R:
Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the pi symbol).

```
PROGRAM: SYNTAX CHECKER

5 REM SYTAX CHECKER - ERIC DOYLE

10 BL=10    :LN=70    :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15
30 READ A:IF A>255THENPRINT"NUMB
ER TO LARGE";LN+(L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT
 D
50 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
60 NEXT L:SYS 49152:NEW
70 DATA 173,5,3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1
847
80 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,168
2
90 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566

100 DATA 3,169,14,141,134,2,141,
32,208,169,6,141,33,208,88,96,15
85
110 DATA 32,124,165,72,138,72,15
2,72,162,0,165,20,133,254,165,21
,1747
120 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,18
9,2346
130 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,
2134
140 DATA 2,165,254,74,74,74,74,3
2,156,192,32,210,255,165,254,41,
2054
150 DATA 15,32,156,192,32,210,25
5,169,13,32,210,255,169,13,32,21
0,1995
160 DATA 255,169,7,141,134,2,104
,168,104,170,104,96,24,105,48,20
1,1832
170 DATA 58,16,1,96,24,105,7,96,
0,0,0,0,0,0,0,0,403
```

by Eric Doyle

Checksum Program

The hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

Type in the Checksum Program, make sure that you've not made any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn brown with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and press RETURN again.

If you want to turn off the checker simply type SYS49152 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one another out are so remote that we believe our listings are more reliable than any other magazine in the world. So get typing! YC

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		SHIFT & CRSR up/down
[F1]		f1 key
[F2]		SHIFT & f1 key
[F3]		f3 key
[F4]		SHIFT & f3 key
[F5]		f5 key
[F6]		SHIFT & f5 key
[F7]		f7 key
[F8]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

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COLLEEN MUSIC CREATOR: Specifically designed to create super efficient complete machine code music programs. Tunes created and run independently of the creator which in turn can be marketed without ANY restrictions. This could be your chance to make money!

Tunes are played back using multi-tasking features normally associated with 16-bit machines — this means you can have two programs running together.

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C16 Software Offer

May it never be said that we don't listen to our readers requests. Due to great demand we are pleased to announce the start of Your Commodore software for C16 and Plus/4 owners.

Due to the great length and complexity of the programs that are available in Your Commodore we provide a Software Service that makes all of the software from each month available on disk or cassette. Unfortunately until now we have not been able to provide C16 and Plus/4 owners with cassettes, only disk. We are therefore extremely pleased to announce that we will now be making cassettes available to readers of the magazine who own C16s or Plus/4s together with a disk option that will contain only programs for these machines.

Versions of the disk or tape will be made available approximately every three months, or when we think that we have collected enough material to make them useful to you. Unfortunately this does mean that you may have to wait a few months for some of the software, but I'm sure that you will think it is worth the wait.

The cost of this service is the same as the tapes and disks for the C64 and C128, that's just £4.00 for cassette or £6.00 for disk.

What Do You Get?

The first of these C16 Specials contains what we think is the best and most useful material that we have published over the last few months. We don't supply instructions with the cassettes since you should have these in the relevant magazines and this helps to keep the cost down. Should you not have any of the back numbers then these are available from the following address:

INFONET LTD. Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB
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please contact this address for prices and availability.

A set of photocopied instructions will also be made available for £1.50 should you want purchase the magazines. These photocopies are available from:

C16 SPECIAL A PHOTOCOPIES
Your Commodore
1 Golden Square
London W1R 3AB

Full Speed Ahead

As you are all no doubt aware the cassette loading and saving on the C16 and Plus/4 is extremely slow. In the February 1986 issue of the magazine we published a routine that will allow you to save your own programs at 10 times the normal speed. This program has proved to be one of our most popular programs for these machines.

Character Generator

The C16 and Plus/4 computers allow you to re-define the character set. This extremely useful program allows you to do this with ease and then save your results for use at a later date. From April 1986.

C16 Synth

This program was published as part of our Programming the C16 series. It has proved extremely popular and has been used to great effect by a number of people. Basically the program allows you to generate music on your C16 that is run independantly of any programs allowing to add music to your own programming masterpiece. From May 1986.

C16 Assembler

No doubt many of you will have played around with a little machine code. The C16 and Plus/4 have built in monitors that makes this extremely easy. By adding this program to your collection you will be able to write your own assembler programs with greater ease. From June 1985.

The Monster Returns

All work and no play is bad for you so we've included this adventure from our July 1986 issue for your enjoyment.

Sound Sampler

Make your computer sound like any instrument you like. With this program you can record any sound and then alter it with your computer, you can even play it backwards. OK so it may not be up to studio quality but it is great fun. From November 1986.

Plus/4 Assembler

This program not only gives your Plus/4 a great assembler but it also adds some extremely powerful commands to the Basic, including a merge routine. From December 1986.

This Issue

As well as all of the above we will of course be including any Plus/4 or C16 programs that appear in this issue of the magazine on the disk and tape.

Please Note

The Commodore Plus/4 computer is compatible with the C16 NOT, as some people have been informed, the C64. Plus/4 programs will not work on the C16 but C16 programs will work on a Plus/4. YC

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Carte Blanche

The cartridge revolution has saturated the market with many variations around a theme. Your Commodore blows the lid off these mysterious little packages.

By Eric Doyle

Once upon a time the main company producing cartridges for the C64 was Commodore itself, closely followed by Supersoft. Apart from *Simon's Basic*, most of CBM's output was games. Supersoft specialised in the excellent monitor series but no-one else really cared.

Suddenly there's a glut of these boxes on the market. Let's consider what the ideal cartridge should contain and see how a few of the most popular ones measure up.

For most people it seems that a turbo tape-to-disk back-up facility is vital but most serious users would also insist upon a code monitor. Basic extensions should be limited to toolkit commands (renumber, merge, delete etc.) so that any programs developed will be transportable from machine to machine, regardless of the cartridge's presence.

Technically the cartridge should be 'transparent' to the standard C64 so that it will rarely have to be removed. For the same reason the addition of a reset and cartridge on/off switch is highly desirable.

The cartridges we will be looking at are *Freeze Frame*, *QuickDisk*, the *Expert*, *Power Cartridge*, *Ultimon*, *Robcom 50*, *Action Replay* and the *Final Cartridge*. There is also a very special utility which doesn't fall into the cartridge category, but more of that later.

Freeze Frame

Evesham Micros produces *Freeze Frame* and *QuickDisk* as separate units. *Freeze Frame* is purely a disk or tape backup utility and, as the instruction leaflet points out, is strictly for personal use only. This area of cartridge usage intensely irritates the software manufacturers for some reason or other. Personally, I feel that dual-deck cassette recorders are responsible for the majority of back-street piracy that goes on. What is disturbing is the fact that European pirates are using this kind of disk utility to put games on to modem-linked networks. Surely it would be possible to produce cartridges with individual identity numbers (like the system which Commodore's Compunet modems use) so that the cartridge must be present when the program is run.

Freeze Frame is a very simple product to use. When the computer is powered up you are faced with the Basic instruction screen. Simply by pressing the return key, the machine resets into normal power-up mode. The program to be backed-up is then loaded and then at a convenient point the reset button on the cartridge is pressed and you then choose one of the three options for a memory save. This can be in turbo-disk, turbo-tape or normal disk format.

The days of the back-up cartridge are numbered as more and more commercial software checks for copier cartridges in a similar way as they look for a disk drive's presence.

QuickDisk

This cartridge does what it claims and very little more. It provides a fast load and save facility as well as making standard disk commands more easily accessible. This avoids the usual rigmarole of opening and closing files. Disk directories can be displayed directly to the screen without affecting any program which is currently in memory.

Compared to most of the packages it is pricey for what it does and a combination of *Freeze Frame* and *QuickDisk* would probably make a more reasonable package.

The Expert

One way to try to defeat the cartridge beaters is to have a 'soft' cartridge. The *Expert* is one such device. It contains RAM memory which must be booted up from disk before use. This means that the cartridge can be modernised easily and cheaply by buying the latest update disk as and when necessary.

The *Expert* contains the expected turbo-disk back-up facility but there is also a very useful monitor which allows you to examine any part of the computer's memory whatever mode the computer is in. This means that the cartridge will still operate even if the ROMs are switched out.

Modern cartridges only use a 'toehold' of a few bytes of memory so that they can interrupt the machine's normal operation on request. Sometimes a program requires the same memory bytes for programming space. This is why some things cannot be saved by certain 'hard' cartridges. With the *Expert* the toeholds can be relocated with a simple command to avoid any clashes with software.

The main disadvantage of the *Expert* stems from its RAM based nature. Occasionally I've found that the memory can be corrupted so that the monitor fails to operate correctly. The only way out of such a problem is to power down, re-boot the cartridge and try again. All very time consuming.

Power Cartridge

This is currently one of my favourite devices for its ease of use and range of facilities. My only vague criticism is the bright red plastic casing which makes it look a little tacky.

With this unit connected you have a Basic extension, monitor, back-up and flexible screen dump facility at your fingertips.

The high resolutiion screen dumps can be selected in one of two sizes: A4 format or postcard size. The dump uses shading to represent different colours and the printout can be reversed to give a 'negative' image if preferred.

The machine code monitor and Basic toolkit commands add the missing essentials to the 64's ROM

routines and the screen menu is easy to understand and use.

Ultimon

This is a conversion of a utility for the Atari and is really just a program stored on cartridge. When you switch the computer on the memory is filled from the cartridge and the program is entered by a SYS command.

The program is a disk monitor which, although sophisticated, is old fashioned. Although most of the external cartridge monitors don't reach the standard of this machine, they do have the advantage of taking up very little space in the computers memory.

I found the instruction manual with the *Ultimon* cartridge to be difficult to follow and gave up when I found that I couldn't get some of the commands to work. There are a lot better monitor cartridges than this and I suggest you look at Supersoft's *Zoom* in preference.

Robcom 50

Although the *Robcom* cartridge is dumped into the C64's memory in the same way as *Ultimon*, it does take advantage of the autoboot facility. This brings in a substantial Basic toolkit and the monitor can be placed almost anywhere in free RAM by a simple command.

The cartridge offers a useful range of turbo-disk and turbo-tape commands. These are backed up by a very useful tape alignment facility and an alignment tape is provided with the package. This is an area all the other turbo-tape programs ignore and is a laudable provision knowing how accurate the azimuth alignment must be for the successful load.

The disadvantage of both *Ultimon* and *Robcom* is that any program accessing the same area will over-write the cartridge and a system crash results.

Action Replay

This is a turbo back-up cartridge which also loads normal disk program files at high speed.

What makes this unique is the ability to back-up multiload games and to save high resolution screens for use with graphics programs. In addition there is a rudimentary code inspector.

The inspector lacks a disassembler or any method of modifying memory contents, restricting its usefulness considerably.

The Final Cartridge

This is a very useful cartridge with plenty of facilities. Apart from a range of very useful toolkit commands, there are turbo-saves, disk commands, high resolution screen dumps and a monitor. Back-ups can be made and the cartridge also has a sprite killer which will help you to walk through a few commercial games without being zapped by any nasties which appear.

Beyond Cartridges

Of the range I have sampled my personal favourites were the *Final Cartridge* and the *Power Cartridge* but it depends on what you need. When buying a cartridge I would insist on a demonstration first because they all represent a substantial financial investment and its better to be safe than sorry.

My attention has recently been drawn to a new Evesham Micros product: *Dolphin DOS*. This is not a cartridge but a replacement chip for the Kernal ROM inside the computer and a circuit board for the 1541 disk drive.

This gives the benefit of converting the 1541 into a pseudo parallel drive. This means that the normal method of loading from disk by feeding the byte contents into the computer in a long cue (serial load) is replaced by allowing eight cues to enter simultaneously via the user port. The new ROM also converts the 64 into a disk only machine so pressing SHIFT and RUN/STOP results in disk loading rather than tape load. If you want to load a tape this can be done by switching out the new ROM and it then emulates the standard chip that it replaces.

The benefits of this chip have to be seen to be believed. A fast load cartridge gives a load speed which is typically five times faster than normal. *Dolphin DOS* increases this to 20 times normal!

Taking an example of a 140 block program, normal loading will take about 80 seconds and fast load will reduce this to a mere 16 seconds. With *Dolphin* the time is four seconds and you get a good quality monitor too!

Unlike many of the cartridges, the *Dolphin* system will load a wider range of protected commercial disks with no problem. It is not infallible but for the awkward disks you simply flick a switch and use the machine as a standard 64.

Another advantage over cartridge loaders is that the speed also applies to sequential and relative files. The speed increase is lower but still reaches a stunning 10 times the normal rate. For example, loading something like *SuperScript* with a cartridge won't make a vast amount of difference but with *Dolphin* you're up and running in seconds rather than minutes.

You never get something for nothing and the first catch with *Dolphin* is the price tag of around £70 (worth every penny, I may add). The second problem is substituting the ROM. If you're lucky your 64 may have a ROM in a DIL socket but the majority of 64s I have seen (and I've seen a lot) have the ROM soldered on to the Circuit board. For most people, even if they are relatively skilled electricians, it will be difficult to remove the ROM without causing damage. I am so impressed with the performance of the system that I'd tend to advise removing the old ROM paying more attention to leaving the circuit board undamaged than worrying about damaging the ROM. You won't need it again so why worry!

The DIL socket is then soldered in place and the chip inserted. If ever you decide to go back to the old ROM it will cost about £30 for a new one but I guarantee that this is worth the risk.

I am not one to rant and rave about hardware but this is an exceptional product and I wonder how I used to manage before.

Although cartridge fast loaders will not enhance the loading speed further I've found that they all operate quite happily with the extended *Dolphin* chip switched out and many will continue to work with it switched in.

Cartridges make great Christmas presents and I can think of nothing better, except perhaps a *Dolphin DOS*.

Touchline

Freeze Frame, QuickDisk, Dolphin DOS: *Evesham Micros, Bridge St, Evesham, Worcs WR11 4RY. Tel: 0386 41989.*

The Expert: *Trilogic, 29 Holme Lane, Bradford BD4 0QA. Tel: 0274 684289.*

Power Cartridge: *Magnam Products, Highlands, Spencer Wood, Reading, Berks RG7 1AH.*

Robcom 50: *Robtek, Unit 4, Isleworth Business Complex, St Johns Road, Isleworth, Middx TW7 6NL. Tel: 01 847 4457.*

Final Cartridge: *H&P Computers, 9 Hornbeamwalk, Witham, Essex CM8 2SZ. Tel: 0376 511471.*

Ultimon: *Computer Support.* YC

Software for sale

If you think that one of our programs looks very interesting, but you can't afford the time to type it in then our software service will help you out.

It's three o'clock in the morning. You sit at the computer keyboard just finished a marathon typing session entering one of the superb programs from *Your Commodore*. Your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how lo ng you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore* Software Service makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

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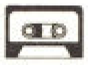
please contact this address for prices and availability.

The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C16 and Plus/4 cassettes. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strap containing the article type, C64 Program etc. So that you can see which programs are available on which format you will also find a couple of symbols after this strap. The symbols have the following meaning:



This symbol means that the program is available on cassette.



These programs are available on disk.

Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk only programs on tape. There is no sense in placing a program that expects to be reading from disk on to tape.

AUGUST 1986

FAST FORMATTER — Speed up the formatting speed of your 1541 disk drive with this handy program (C64).
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BACKDROPS — Sample backgrounds and sprites for use with the 3IN1 EDITOR published in August 1986.
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ICON DRIVER — A small routine that allows you to move a sprite around the screen with a joystick. Useful if you want to develop an icon program (C64).
RECONFIGURE — Develop routines to alter the memory configuration of your C64 with ease.
CROSSWORD — Put your brain to work with this superb crossword program. Includes four crosswords for you to try (C64).
ALL CLEAR — Some interesting ways to clear the screen with this collection of routines (C64).
ADVENTURE GRAPHICS — Add graphics capability to our ADVENTURE AID program published in the May 1986 edition of Your Commodore (C64).

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OCTOBER 1986

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PILOT — A full implementation of this extremely popular educational language for your C64.

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REMEMBER THE PLUS/4 – An assembler for Plus/4 owners. Complete with a couple of new Basic commands including a MERGE facility.

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DISK YDDEC86 £6.00
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Cassettes or disk are available back to March 1986. Please ring the Editorial office (01-437-0626) for details of these. YC

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Interfacing with the RS232

Many people switch off when they hear the mention of the RS232 interface and related subjects. This article is aimed at clearing up some confusion and doubt.

By Steve Carrie

Some (if not most) of you will have heard by now of that favourite of all computer industry subjects, the RS232 communications standard. People have been known to go weak at the knees and hide when it is mentioned. Every day, it causes problems for computer engineers connecting up equipment such as printers and modems. It has even given rise to a lucrative business of building the so-called "break-out boxes" for monitoring and "fixing" RS232 lines.

If it is supposed to be an industry standard, why does it cause so much hassle? Every computer manufacturer has different ideas on how to build a computer; which devices to use, how big the screen should be, etc. It would seem that this train of thought also includes the RS232 standard.

Now, before I go on, let me say that the idea behind RS232 is great. A standard interface for connecting different types of hardware (including computers) together. RS232 is really useful in the field of telecommunications. Modems are usually connected to a computer via an RS232 link. You can connect two computers together and transfer programs between them (a technique often called "porting").

Unfortunately, things are not this simple. With different manufacturers having different ideas on how to implement the standard (Commodore is no exception) a great deal of confusion can arise when two pieces of hardware are to be connected together. Most of this confusion surrounds the way in which the control lines of an RS232 should be used. Thankfully, this does not concern us in this article since we will be using only a basic RS232 interface.

Basic RS232

As you may know, RS232 uses the serial method of data transmission. Information is sent bit by bit along a single wire to a receiving machine. Since data may flow in both directions, two wires plus a common return are required to make a basic RS232 communication line. The lines are usually connected to equipment by a 25-way D-type connector. Data leaving a computer exits via pin two and incoming data enters via pin three. The Ov return is connected to pin seven. This gives the "3-line" RS232 interface. There is no control over the flow of the data in either direction unless handled by the software (more on this later). An RS232 interface using more than these three lines is known as an "X-line" interface.

It is best to use a three or four core cable with a shield (we will see why in a moment) rather than separate wires.

For the purposes of this article, this is all we require. "Ah yes" you say, "that's all very well but my Commodore doesn't have a 25-way d-type connector let alone any RS232 interface". True it doesn't have a 25-way connector but it does have an RS232 interface. You mean you didn't know?

Commodore RS232

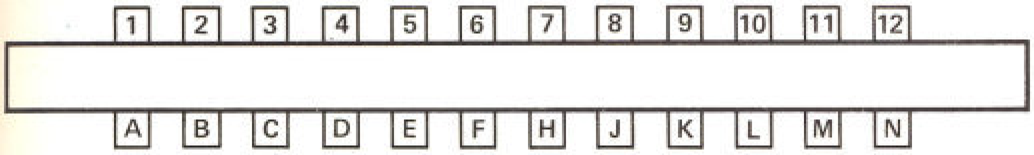
Since the time of the Vic 20, Commodore gas "programmed" in a limited form of RS232 port. I say programmed because the hardware device normally associated with RS232 communications, the Universal Asynchronous Receiver/Transmitter (UART), is not present in the circuitry of the Vic 20, C64, 64C, C128 and C128D. The omission of the C16 and Plus/4 is intended. The C16 cannot handle RS232 comms (we shall see why in a moment). The Plus/4 on the other hand is omitted for a different reason. This machine DOES have a UART.

RS232 signals appear at the user port. This is exactly the reason why the C16 cannot handle RS232; it does not have a user port (a strange omission by Commodore. Anyone know why?). All the conversion is handled by the Operating System (Kernel). Thus

3-LINE RS2 INTERFACE CONNECTIONS (25-way D-connector)

pin	function	
2	Transmitted data	Sout
3	Received data	Sin
7	Common (Ov)	Gnd

RS232 LINES FROM THE USER PORT



Pin ID	Description	Abreviation
C	Received data	Sin
D	Request to send	RTS *
E	Data terminal rdy.	DTR *
H	Received line sig.	DCD *
K	Clear to send	CTS *
L	Data set ready	DSR *
M	Transmitted data	Sout
B	Received data	Sin
A	Protective ground	GND
N	Signal ground	GND
2	+5V supply	

*These lines are not used in 3-line mode

Signal ground is the Common return.
Protective ground for screening.

Maximum of 100mA may be drawn from the +5V supply

Fig 1

(except in the case of the Plus/4) the user port coupled with the Kernel becomes almost the equivalent of the 6551 UART (the 6551 is the device that the software is supposed to emulate).

In the Vic the user port is controlled by a Versatile Interface Adaptor (VIA). In the other machines a Complex Interface Adaptor (CIA) is used (not a lot of difference as far as this article is concerned). Now before some of you run and hide at the mention of VIAs and CIAs, let me say that (thankfully) we do not have to program these devices directly. The Kernel handles all of the RS232 associated programming.

Figure 1 shows the RS232 associated connections to this port looking from the rear of the machine. Note that the user port uses a 0.156" edge connector (available from Maplin: order number BK74R). The top row of terminals are identified with numbers while the bottom row terminals are identified with letters. This means that it is very easy to connect the socket the wrong way up which could have disastrous consequences for your computer. The correct way is with the letters to the bottom as shown.

Connecting Up

The terminals labelled Sout (transmitted data) and Sin (received data) and GND (Ov common) are the three lines we need. Note however that there are TWO terminals labelled Sin. The reason for this lies with the way in which the RS232 on these machines works. One of the Sin lines is for data, the other is a flag or trigger input. Because the Commodore RS232 relies on Non-Maskable Interrupts (NMI) or interrupt request (IRQ) in the case of the Plus/4, there must be some form of detection to let the system know when data is being received.

When data is being received over the Sin line, the voltage level on this pin changes rapidly, causing interrupts to occur. The system software collects the data on the Sin line, placing it in an area of memory called the Receive Buffer. There is also a Transmit buffer for outgoing data. Thus the reception and transmission of data is basically transparent to the user. However, this method has its problems as we will see. The practical upshot of all this is that BOTH Sin terminals must be connected to the Sin line. Since they are next to one another, this is no great problem.

Also note the connection called PROTECTIVE GROUND. This terminal should be connected to the shield of your cable if you suspect any outside electrical interference of causing data errors.

While on the subject of making connections, you will have to use a soldering iron. Now don't run and hide (again). If you are not too sure about handling one, get an electronics hobbyist friend to do it for you.

It should go without saying that YOU SHOULD NEVER MAKE CONNECTIONS TO THE SOCKET WHILE IT IS CONNECTED TO THE COMPUTER. Always disconnect the socket BEFORE making or changing any connections and NEVER connect the socket to a line machine. ALWAYS switch off the power BEFORE plugging or unplugging!

OK. So you've connected your socket up and plugged it in the correct way... what now? If you only want to communicate with another Commodore (Vic, C64, Plus/4 or C128) then there is no great problem. The only thing to watch is that you must connect the Sout of one machine to the Sin of the other as in Figure 2 in order for them to exchange data (a bit obvious really!).

Commodore connections

If you don't intend connecting your machine to anything other than another Commodore, you can skip the next bit all together and get on with the programming. If you have a friend with one of the machines mentioned, you will be able to type messages to one another; handy if you live next door and you have a long piece of 3-core cable – your own mini-network! (Not recommended if you live across the street or several houses away!) How far you will be able to keep the machines apart depends very much on the operating conditions. Electrical interference may cause errors and there will come a point where the line is just too long. It's best to experiment with what you've got.

Non-Commodore Connections

This is where things get tricky. Connecting to anything other than a similarly equipped Commodore has its

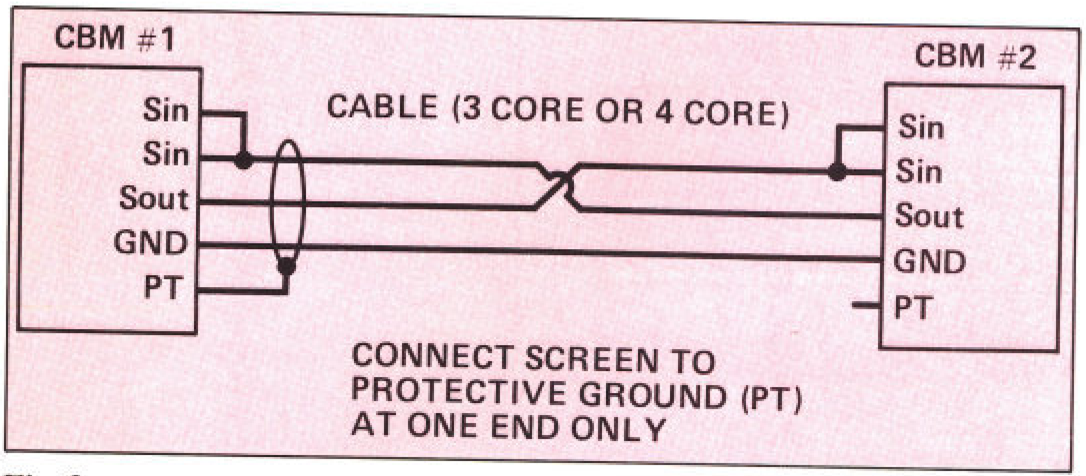


Fig 2

problems. This is because normal RS232 requires logic levels -12v (logic 1) and +12v (logic 0) as opposed to the Commodore RS232 logic levels of 0v (logic 0) and +5v (logic 1) (No that isn't a mis-print. RS232 logic is opposite voltage level-wise to your Commodore). However this problem can be overcome quite easily. There are various logic devices available specifically for this purpose. Among these are the RS423 line driver 3691 and RS423 line receiver 88LS120N. These devices convert between TTL logic levels and RS423 logic levels. RS423 is another (stricter) standard which is compatible with RS232 (at least to a certain extent). The beauty of using these devices is that they will operate from a +5v/-5v supply. This means that the user port's +5v output (pin 2: see Figure 1.) may be used for the +5v supply and all that is required is a -5v supply. These are the devices used by the BBC micro for it's RS423 port. Figure 3 shows the circuit required.

I can hear the groans of discontent. "I can't do that! I've never built an electronic circuit before!". If you do have an electronics hobbyist friend, try bribing him/her into building it for you.

I will not go into detail over the construction of the interface. I will assume that if you are building this, you know what you are doing. The 74LS00 device is used here as a logic inverter. I suggest that you use i.c. sockets so as not to subject the devices to heat which could damage them.

Power Supplies

If you plan to use the mains (careful!) power supply circuit shown in Figure 4, I suggest that you use both the +5v and -5v supply circuits so as not to rely too much on the already overworked computer power supply. It goes without saying that no-one should use the mains unless they do know EXACTLY what they are doing.

The alternative battery supply circuit in figure 5 assumes that you are using the +5v supply from the computer. This circuit may also be used with one of those pocket calculator mains adaptors (like the Spectrum power supply) since the circuit regulates the voltage to -5v. The diodes shown prevent damage to the circuit if the battery/adaptor is incorrectly connected. Remember to disconnect the battery when you are not using the interface. This has the advantage of not requiring you to build a mains power supply.

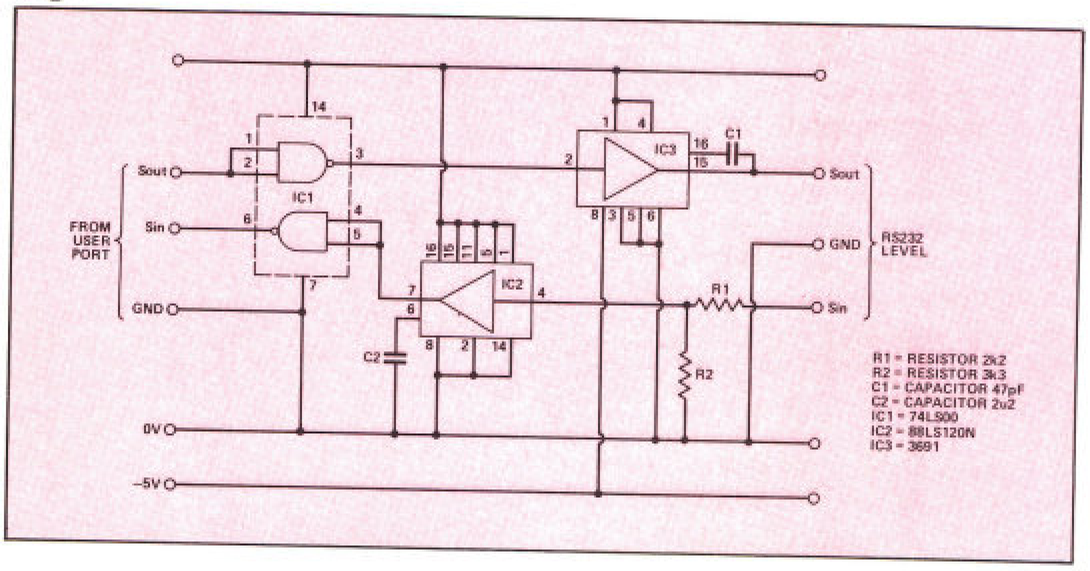
Remember that you cannot connect an ordinary Commodore (without this interface) to one using this circuit. Both machines must be similarly equipped. Using this interface, you will be able to connect your Commodore to other computers such as the BBC and any suitably equipped IBM compatible. I have connected my C128 to my Televideo TS1605 (IBM compatible running MSDOS) and transferred files between them without any problems. This should also work with the Commodore PC10 and PC20 IBM compatibles. The only thing to watch for here is that most IBM compatibles need to have pins four and five (RTS and CTS) connected together as shown in Figure 6. The BBC will also require a similar connection. Because of RS232 differences between systems, I cannot say that this will work with every machine, but it will work with most. I have also connected my 128 up to a mainframe DECSYSTEM 2050 running at 1200 baud with absolute success.

Programming Commodore RS232

OK so you've got this far. You've linked your Commodore to another machine. What now?

Using the RS232 interface on a Commodore is much the same as using a printer or a disk drive. You must OPEN a logical file and use PRINT# and GET# to send and receive data. Note that you should NOT use INPUT# since there is a possibility that the system might hang by attempting to get input when it isn't there. Also be aware that on the Vic 20 and C64, the RS232 receive and transmit buffers are created at the top of Basic memory when the OPEN command is executed. (The buffers are permanently defined on the C128 and, I think, the Plus/4). This has the effect of wiping out any variables previously defined. (It performs a CLR). Therefore, you should make the OPEN RS232 statement the first in any program. Another, more serious problem occurs if your Basic program is very large. Then there is a chance that OPENing an RS232 channel may destroy the end

Fig 3



of your program. So Beware!

The format for the OPEN statement is shown below:

OPEN lfn,dev,sec,CHR$ (control register)+CHR$ (command register)

where:
lfn = logical file number
dev = device (2 for RS232)
sec = secondary address (usually 0)
<control register>= see below
<command register>= see below

The RS232 interface is device number two. In order to operate correctly, the system requires you to tell it how fast you wish to transfer data (baud rate) and the format of the data number of stop bits, number of data bits, parity). The control register tells the system the baud rate, stop bits and data bits as in Table 2.

bit	7	6	5	4	3	2	1	0
	S	D	D	R	B	B	B	B

S – stop bits	D – data bits	B – baud rate	R – Rclock
S	DD	BBBB	
0 – one	00 - 8	0001	50
1 – two	01 - 7	0010	75
	10 - 6	0011	110
	11 - 5	0100	134.5
		0101	150
		0110	300
		0111	600
R (plus 4 only)		1000	1200 (C64 max)
0 – external clock		1001	1800
1 – internal clock		1010	2400 (max)
(keep to 1)			
		Plus/4 capable of up to 19200 baud	

Table 2

2400 baud is the maximum speed that is available on the Commodore RS232 on the C128. The C64 will allow up to 1200 so this is the maximum baud rate that I will use in the examples. If however you have any problems, try selecting 600 baud instead.

The command register defines other interface parameters as follows

bit	7	6	5	4	3	2	1	0
	P	P	P	D	T	T	R	H

P – Parity D – duplex H – handshake
T – Transmit control R – receive control

PPP	D	H (non PLUS4)	H (PLUS4)
000 Disabled	0 Full	0 3-line	0 Receiver on
001 Odd	1 Half	1 X-line	1 Receiver off
011 Even			
101 Mark (1)			
111 Space (0)			

TT (Plus/4 only)	R (Plus/4 only)
00 IRQ Disabled; RTS=1; TX off	O IRQ on
01 IRQ Enabled; RTS=0; TX On	1 IRQ off
10 IRQ Disabled; RTS=0; TX On	
11 IRQ Disabled; RTS=0; BRK	

Table 3

Plus/4 users should refer to pages 207-211 of the user manual for further details on their machine's RS232 interface. This machine can handle transfer rates of up to 19200 baud.

Handshake determines how the interface will operate. We will be using 3-line. X-line is where you are using control lines as well as the data lines. This makes things a bit complex so we will stick to 3-line.

Duplex should be set to Full. This determines how the receive and transmit will behave.

Parity is a kind of error check. When data is received, the system checks it to see if it agrees with the parity. If not, the parity error bit in the variable ST (status) is set indicating some sort of error. These bits allow you to set the type of parity check required. Of course, both machines should be set to the same parity. In most cases, parity is not used and error checking is done in a different way (more on this later).

This may seem a little complex but it isn't really. Lets suppose that we want to open an RS232 channel to run at 1200 baud, eight data bits, one stop bit, no parity. The OPEN statement would be:

OPEN 2,2,0,CHR$(24)+CHR$(0) (non Plus/4)
OPEN 2,2,0,CHR$(24)+CHR$(5) (Plus/4)

and that is that! Simple, eh? In fact, if you stick to this particular format of eight data bits and no parity, you can't really go wrong. Just change the baud rate to suit.

Incidentally, the Commodore 64 programmers reference Guide tells you that the command register character is NOT required. It's probably safer to leave it in. My C128 sometimes won't work without it!

Using PRINT#AND GET# we can write a fairly simple terminal program running at 1200 baud. Running this on two machines (assuming its two Commodores) you will be able to type in a message on one keyboard and see it appear on the other machines display as well as your own. Figure 7 shows the program while Figure 8 shows a similar program for an IBM compatible machine running PCDOS or MSDOS and GWBASIC.

Figure 7 Commodore Basic mini terminal program

```
10 OPEN 2,2,0,CHR$(24)+CHR$(0)
11 REM PLUS4 USERS USE OPEN
2,2,0,CHR$(24)+CHR$(5)
20 PRINT "[CLS]"
30 GET#2,A$
40 IF A$<>"" THEN PRINT A$;
50 GET B$
60 IF B$<>"" THEN PRINT
B$;:PRINT#2,B$;
70 GOTO 30
```

Figure 8 GWBASIC mini terminal program

```
10 OPEN "COM1:1200,N,8,1" AS £1
20 CLS
30 IF LOC(1)=0 THEN 50
40 A$=INPUT$(1,#1):PRINT A$;
```

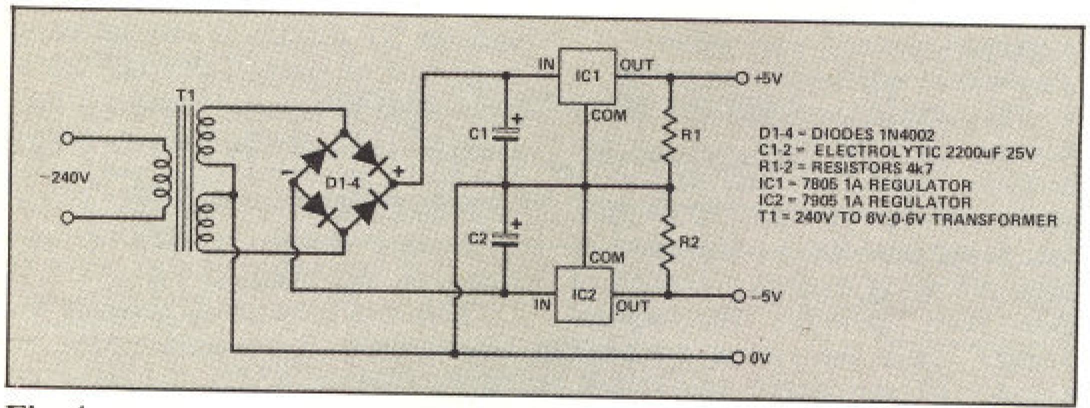


Fig 4

```
50 B$=INKEY$
60 IF B$<>"" THEN PRINT B$;:PRINT#1,B$;
70 GOTO 30
```

Both programs check first for a character from the RS232 port. If one is found, it is output to the screen. If not, the program checks for a keyboard input. If found, the character is sent to the screen and also to the RS232.

Another interesting experiment when using an IBM compatible machine is to make the following change to the mini terminal program on the Commodore:

```
60 IF B$<>"" THEN PRINT£2,B$;
```

and run it. Now type the following on the IBM while in DOS:

```
MODE COM1:1200,N,8,1
CTTY COM1
```

(MODE is external so disk containing the command must be in the default drive).

This causes the IBM to think that its input/output device is the RS232 port instead of the console. This has the very odd effect of making the Commodore control the IBM! (although the character sets are different and some odd graphics characters may be printed). To return control to the IBM console, you must type CTTY CON on the Commodore.

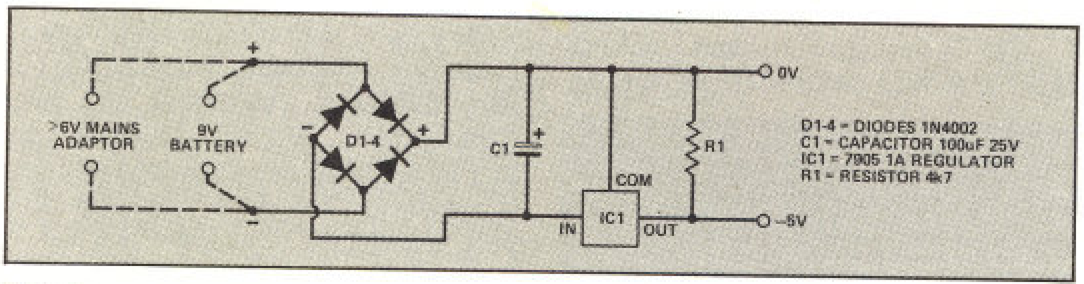
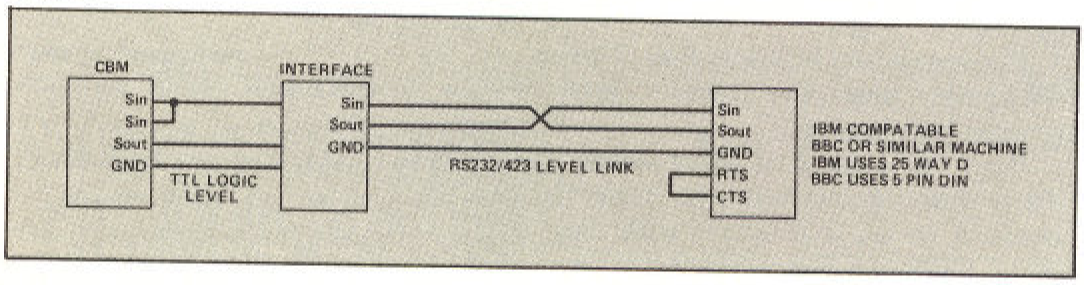


Fig 5

Obviously, not many of you have access to an IBM, but this experiment does show up one very important problem with the Commodore's 3-line RS232 interface. If you take control of the IBM using the CTTY COM1 command again and type DIR which is the MSDOS command to display the directory, the first few lines are printed normally and then suddenly, there is a whole lot of garbage. If you slow down the baud rates to say 300, the problem may disappear. Why does this happen? Remember what I said about the Receive buffer? Well what happens is that data is received transparently over the RS232 lines and placed in the buffer. The buffer fills up quicker than Basic can empty it with the result that the buffer overflows and data is lost. Buffer overflow can be detectd by examining the ST status variable, but Basic is just too slow and you may still loose data.

Fig 6



Solutions

There are a few ways of solving this problem:

1. Use a slower baud rate to let Basic keep up.
2. Devise some form of software data flow control.
3. Connect control lines up and use an x-line interface.
4. Use machine code to process RS232 data.

Option 1 is not a good idea. Anyone who has used an RS 232 link at 300 baud will know why (yawn!).

Option 2 is better but requires programming which we will touch on later when we discuss file transfer.

Option 3 is not really practical here.

Option 4 is probably the best solution in this case. Data can be removed from the buffer much faster using machine code and this will be fine for the speeds at which we will be working (up to 1200 baud).

A very short machine code program can be written to handle the RS232 interface. The routine that follows is given in the form of a Basic loader. Change the variable AD to any free area in your computer's memory (the tape buffer is a good place). This program is for a C128 but it should work on any of the Commodore machines discussed.

```
10 OPEN 2,2,0,CHR$(24)+CHR$(0)
11 REM PLUS4 USERS: OPEN 2,2,0,CHR$(24)+CHR$(5)
20 AD=2816:CA=AD
30 READ BY
40 IF BY -1 THEN POKE AD,BY:AD= AD+1:GOTO 30
50 :
60 PRINT CHR$(14):REM SWITCH TO LOWERCASE'
70 SYS CA
80 :
90 :
100 DATA 162,2,32,198,255,32,228,255, 168
110 DATA 32,204,255,152,240,3,32,210, 255
120 DATA 32,228,255,240,233,72, 162,2,32
130 DATA 201,255,104,32,210,255, 32,204
140 DATA 255,56,176,217,-1
```

The only way out of this program is a RUNSTOP/RESTORE. Table 3 is the disassembled code with comments (addresses may differ from your version.

```
OBOO LDX #$02         ; Make channel 2 the current input device
OBO2 JSR $FFC6
OBO5 JSR $FFE4        ; Scan the RS232 buffer for 1 character
OBO8 TAY              ; Save data
OBO9 JSR $FFCC        ; Clear the channel
OBOC TYA              ; Restore the date
OBOD BEQ $OB12        ; If data is a null (a zero byte) then skip
OBOF JSE $FFD2        ; Output valid character
OB12 JSR $FFE4        ; Check for keyboard input
OB15 BEQ $OBOO        ; If none then recheck RS232
OB17 PHA; Save data
OB18 LDX #$02         ; Make channel 2 the current output device
OB1A JSR $FFC9
OB1D PLA              ; Restore data
OB1E JSR #FFD2        ; Send byte to RS232
OB21 JSR $FFCC        ; Clear channel
OB24 SEC              ; Force loop to check RS232 input
OB25 BCS $OBOO
```

Table 3

The program uses the kernal jumptable calls so it should be valid for all of the machines.

After the machine code has been placed in memory, the RS232 channel is opened with a file number of 2 (the channel number. If you change this you must change the two LDX instructions in the code) and the machine code routine called. Now the RS232 receive buffer does not get a chance to fill up so no data is lost. The OPEN statement could be replaced by the code in Table 4.

```
LDA #$02         ; Channel 2
LDX #$02         ; Device 2
LDY #$00         ; Secondary Addr. 0
JSR $FFBA        ; Set logical file
LDA £$01         ; 2 chars in filename
LDX # NAME       ; Pointer to filename
LDY # NAME       ; Pointer to filename
JSR $FFBD        ; Set filename
JSR $FFCO        ; Open RS232
Rest of code
.NAME:#B:24,0 ; Control and command register values (PLUS 4---
.NAME:#B:24,5) (#B: Is the byte directive of my C64 and C128
assemblers)
```

Table 4

Character set translation

All this should be fine for Commodore to Commodore communications. It will also work with Commodore to IBM/BBC etc. comms but may yield strange results, the reason being that the Commodores do not use standard ASCII codes. They use what is sometimes called PETSCII, the Commodore PET being the first to use it. The most noticeable effect of this is that certain characters will appear on the Commodore's screen as graphics characters. The solution to this is to insert some form of translation table or routine into the code. Since data flows two ways, a routine or table would be required for each of input and output.

Two translation tables, each of 256 bytes, are required to handle outgoing and incoming data translations. The following program builds the translation tables and the machine code into memory starting at address AD. It needs at least 600 bytes to operate in so you need only change AD to the address you require. This version is for the C128 (Program Translate).

Program Translate

Line 5: AD=start address; BR=Control reg; CR=command reg.
Lines 10-100: Prepare tables
Lines 111-113: Setup name of channel (register images)
Lines 120-160: POKE receive table
Lines 170-200: POKE transmit table
Lines 210-230: POKE code to memory
Lines 240-270: Adjust table references in code
Lines 280-290: Adjust register image references in code
Lines 300-310: Select lowercase and call routine
Lines 330-370: Code data

Table 5 shows the disassembled machine code (addresses are offsets from the start address):

Basically, the operation is the same as before except:

1. The channel is opened from machine code.
2. Characters sent and received are translated.

Note that the backslash (\) character received will be displayed as a pound sign. The CBM Charset does not have a backslash.

Transferring files via RS232

This is probably the most useful application of RS232; transferring data between unalike machines. It is possible to transfer programs between two entirely different machines.

When using a 3-line interface, it is necessary to introduce some form of protocol into the software at both ends. This ensures that each machine understands exactly what the other intends to do.

A typical protocol exchange would look like a conversation between the two machines:

machine 1: Are you there?
machine 2: Yes.
machine 1: Requesting data transfer.
machine 2: OK.
machine 1: Transferring data (block of data sent)
machine 2: Received data.

and so on. The "are you there", "yes" etc. messages are actually 1 byte control codes. Normal ASCII has 32 control codes (codes 0-31). The actual usage varies from system to system and there are one or two protocol standards. For your own use, you don't have to follow any set protocol AS LONG AS BOTH MACHINES ARE USING

THE SAME ONE. Figure 9 gives a list of ASCII code 0-31 and their meanings.

Note the two marked XON and XOFF. These you may recognise. XON/XOFF protocol is useful where large amounts of continuous data are being transferred. The receiving machine can send an XOFF code when it wants the transmitting machine to hold off sending data, and send an XON when it wants to resume. This type of control is often used with dumb terminals to mainframes.

Another method of transferring data is to send it in blocks of 2-255 characters (usually 128 chars). This removes the need for XON/XOFF control because as each block is sent, the two machines exchange control codes. This method of transfer also allows error checking to be carried out on the data. One of the most popular error check methods is the Cyclic Redundancy Check (CRC). We won't go into this here as there is no real need for such a complex check with hard-wired RS232. CRC is really useful for Telecommunications via modems. Phone lines are noisy and data errors may easily result at high baud rates. The CRC error check allows the two machines at either end to check the data for errors, if an error is found, the receiving machine requests that the data is transmitted again.

When sending data using the block method, the software collects data bytes into "packets" of 128 bytes. Assuming the link is open, the transmitting machine (TM) sends a start-of-transmission code. The receiving machine (RM) replies with an acknowledge code. The TM then sends a start-of-block code followed by a data packet followed by an end-of-block code. The RM replies with an acknowledge code (assuming the data was received correctly) and the TM sends the next block. This continues unitl all data has been exchanged, whereupon the TM sends and end-of-transmission code and the link enters a wait-state.

The above description does not conform to any standard but will work. If error checks are included, the RM could send a data-error code if the data had been corrupted whereupon the TM would re-transmit the same data packet.

```
0000 LDA #$02              ; Logical channel 2
0002 LDX #$02              ; Device 2
0004 LDY #$00
0006 JSR $FFBA             ; Set lfn
0009 LDA £$02              ; Name length (2 chars)
0008 LDX #<NAME            ; NAME is address of char string
000D LDY #>NAME
000F JSR $FFBD             ; Setnam
0012 JSR $FFCO             ; Opem
0015 LDX #$02              ; Make RS232 the input device
0017 JSR $FFC6
001A JSR $FFE4             ; Get a character
001D TAY; Save it
001E JSR $FFCC             ; Restore default device
0021 TYA
0022 BEQ 002A              ; If char =0 then no char rec.
0024 LDA RXTABLE,Y         ; Get PETSCII char from TXTABLE
0027 JSR $FFD2             ; Send to screen
002A JSR $FFE4             ; Check keyboard
002D BEQ 0015              ; No char, loop to check RS232
002F TAY                   ; Index
0030 LDA TXTABLE,Y         ; Get ASCII equivalent
0033 PHA                   ; Save
0034 LDX #$02              ; Make RS232 the default output
0036 JSR $FFC9
0039 PLA
003A JSR $FFD2             ; Output character
003D JSR $FFCC             ; Restore normal output
0040 SEC                   ; Forced loop
0014 BCS 0015
```

Table 5

The program given in Figure 10 should run on any of the CBM machines discussed and is written in Basic. Since the comms are being controlled by the software, the receive buffer will not overflow. It allows a user to transfer a data file from one machine to another. The link is 1200 baud, eight data bits and no parity. It should be run on both machines. The control codes are shown in Table 6.

Note that I'm not using some of these as they should be used but, as I said earlier, as long as you stick to the same protocol on both machines, you'll be OK.

Possible Developments

The example programs I've given here do not show all of what may be achieved using the RS232 interface. It is possible (using a special version of the circuit described earlier) to have more than two machines running on a single 3-line RS232 commlink. This would allow a group of users (with special software written in machine code for maximum speed) to set up a mini-network. The possiblities are endless. I hope this article has helped to fuel your imagination. If you have any comments or ideas, please write to me c/o Your Commodore or leave a COURIER on Compunet ID SC12.

Table 6

Code	ASCII	Meaning in this program
5	ENQ	Attent/enquire
6	ACK	Acknowledge
1	SOH	Start transfer (transfer filename)
4	EOT	End transfer
2	STX	Start block
3	ETX	End block
26	SUB	Enter terminal mode (special seq.)
10	DLE	Exit terminal mode (data link escape)

Figure 9 ASCII Control Codes.

Code	ASCII	Function	Code	ASCII	Function
0	NUL	Null	15	SI	Shift in
1	SOH	Start Heading	16	DLE	Data link escape
2	STX	Start text	17	DC1	Device control 1 XON
3	ETX	End text	18	DC2	Device control 2
4	EOT	End transmission	19	DC3	Device control 3 XOFF
5	ENQ	Enquire	20	DC4	Device control 4
6	ACK	Acknowledge	21	NAK	Negative acknowledge
7	BEL	Rings terminal bell	22	SYN	Synchronous idle
8	BS	Backspace	23	ETB	End transmission block
9	HT	Horizontal tab	24	CAN	Cancel
10	LF	Line feed	25	EM	End medium
11	VT	Vertical tab	26	SUB	Special sequence
12	FF	Form feed	27	ESC	Escape
13	CR	Carriage return	28	FS	File separator
14	SO	Shift out	29	GS	Group separator
			30	RS	Record separator
			31	US	Unit separator

Fig 10

```
PROGRAM: TRANSLATE


READY.

BB  5 AD=4864:NA=AD:BR=24:CR=0
B8  6 REM PLUS4 USERS USE BR=24:
    CR=5
B6  10 DIM F%(255),T%(255)
AF  20 FOR J=0 TO 64:T%(J)=J:NEX
    T
65  30 T%(10)=0:T%(20)=8
34  40 FOR J=65 TO 90:K=J+32:T%(
    J)=K:NEXT
23  50 FOR J=91 TO 95:T%(J)=J:NE
    XT
E5  60 FOR J=193 TO 218:K=J-128:
    T%(J)=K:NEXT
92  70 T%(146)=16:T%(133)=16
35  80 FOR J=0 TO 255
F7  90 K=T%(J)
EA  100 IF K<>0 THEN F%(K)=J:F%(
    K+128)=J
EC  110 NEXT
A1  111 POKE AD,BR
92  112 POKE AD+1,CR
DF  113 AD=AD+2
5B  120 RB=AD
F5  130 FOR X=0 TO 255
BC  140 POKE AD+X,F%(X)
14  150 NEXT
FA  160 AD=AD+256:TB=AD
2D  170 FOR X=0 TO 255
C2  180 POKE AD+X,T%(X)
3C  190 NEXT
72  200 AD=AD+256:RT=AD
5E  210 RESTORE
92  220 READ BY
D8  230 IF BY<>-1 THEN POKE AD,B
    Y:AD=AD+1:GOTO 220
A4  240 HR=INT(RB/256):LR=RB-HR*
    256
AC  250 HT=INT(TB/256):LT=TB-HT*
    256
8C  260 POKE RT+37,LR:POKE RT+38
    ,HR
23  270 POKE RT+49,LT:POKE RT+50
    ,HT
C5  280 NH=INT(NA/256):NL=NA-NH*
    256
C5  290 POKE RT+12,NL:POKE RT+14
    ,NH
17  300 PRINT CHR$(14)
EF  310 SYS RT
C1  320 END
E8  330 DATA 169,2,162,2,160,0,3
    2,186,255,169,2,162,0,160,0,
    32,189,255,32,192
7B  340 DATA 255,162,2,32,198,25
    5,32,228,255,168,32,204,255,
    152,240,6,185,0
2A  350 DATA 0,32,210,255,32,228
    ,255,240,230,168,185,0,0,72,
    162,2,32,201,255,104
61  360 DATA 32,210,255,32,204,2
    55,56,176,210,-1

IOPROGRAM: FIGURE 10


READY.

2F  100 OPEN 2,2,0,CHR$(24)+CHR$
    (0)
C6  110 REM +4 OPEN 2,2,0,CHR$(2
    4)+CHR$(5)
42  120 :
BA  130 REM C64 MAY NEED TO RUN
    AT 600 BAUD
93  140 REM I.E. OPEN 2,2,0,CHR$
    (23)+CHR$(0)
AC  150 :
4E  160 GOSUB 2390:REM SETUP TAB
    LES
90  170 :
0A  180 PRINT"[CLR]";CHR$(14)
84  190 :
3D  200 REM ********************
    ***********
55  210 REM MAIN LOOP STARTS HER
    E
49  220 REM ********************
    ***********
FD  230 REM WAITS FOR RS232 ENQ
    CODE
6F  240 REM CTRL-F (FILE TRANSFE
    R)
0D  250 REM CTRL-Z (TERMINAL MOD
    E)
F2  260 REM CTRL-C (EXIT PROGRAM
    )
35  270 :
23  280 :
69  290 PRINT "[SA]WAITING [SE,S
    N,SQ] OR KEYPRESS"
13  300 GOSUB 1210: REM GET FUNC
    TION
F9  310 ON C GOSUB 400,530,800,3
    60
56  320 REM  GOSUB MODE,FTX,TERM
    OD,EXIT
39  330 GOTO 290
6F  340 :
65  350 :
74  360 REM EXIT PROGRAM
BF  370 CLOSE2:END
47  380 :
BD  390 :
CB  400 REM MODE
79  410 REM ENQ RECEIVED - WAIT
    FOR EITHER
9B  420 REM SS  (TERMINAL MODE R
    EQUEST)
F7  430 REM SOH (FILE TRANSFER R
    EQUEST)
83  440 :
B9  450 PRINT "[SE,SN,SQ] RECEIV
    ED.."
37  460 GOSUB 900 : REM SEND ACK

7C  470 GOSUB 1310: REM GET RECE
    IVE MODE
52  480 ON C GOSUB 640,730
65  490 RETURN
CF  500 :
C5  510 :
6F  520 REM FTX
CF  530 REM INITIATE FILE TRANSF
    ER
B5  540 GOSUB 2300:REM FILENAME
    FROM USER
84  550 GOSUB 950 :REM SEND ENQ
AE  560 GOSUB 1150:REM WAIT FOR
    ACK
50  570 GOSUB 1050 :REM SEND SOH
     + FILENAME
D2  580 GOSUB 1150:REM WAIT FOR
    ACK
1E  590 PRINT "[SF]ILE TRANSFER
    BEGINS.."
A7  600 GOSUB 1760:REM RUN FILE
    TRANSMIT
B2  610 RETURN     :REM BACK TO M
    AIN LOOP
54  620 :
42  630 :
7D  640 REM RESPOND TO FILE TRAN
    SFER REQUEST
13  650 PRINT "[SF]ILE TRANSFER
    REQUEST ..."
BC  660 FR$=""
97  670 GOSUB 1380:REM GET NAME
    FROM RS232
3C  680 GOSUB 900 :REM SEND ACK
B8  690 GOSUB 1980:REM FILE RECE
```

```
      IVE
74   700 RETURN     :REM BACK TO MAIN LOOP
F2   710 :
EB   720 :
FE   730 REM RESPOND TO TERMINAL MODE REQ.
67   740 PRINT "[ST]ERMINAL MODE REQUEST..."
F2   750 GOSUB 900 :REM SEND ACK
B0   760 GOSUB 1520:REM RUN TERMINAL MODE
2F   770 RETURN     :REM BACK TO MAIN LOOP
35   780 :
23   790 :
86   800 REM INITIATE TERMINAL MODE
89   810 PRINT "[SI]NITIATING TERMINAL MODE"
3D   820 GOSUB 950 :REM SEND ENQ
99   830 GOSUB 1150:REM WAIT FOR ACK
10   840 GOSUB 1000 :REM SEND SS
A5   850 GOSUB 1150:WAIT FOR ACK
B9   860 GOSUB 1520:REM RUN TERMINAL MODE
9B   870 RETURN     :REM BACK TO MAIN LOOP
49   880 :
47   890 :
BB   900 REM SEND ACK
40   910 PRINT#2,CHR$(6);
15   920 RETURN
9F   930 :
95   940 :
34   950 REM SEND ENQ
97   960 PRINT#2,CHR$(5);
43   970 RETURN
ED   980 :
DB   990 :
5A   1000 REM SEND SS
E0   1010 PRINT#2,CHR$(26);
71   1020 RETURN
30   1030 :
2E   1040 :
C1   1050 REM SEND SOH + FILENAME
02   1060 PRINT#2,CHR$(1);
E9   1070 PRINT#2,CHR$(FL);
30   1080 FOR X=1 TO FL
7E   1090 PRINT#2,CHR$(T%(ASC(MID$(F$,X,1))));
D2   1100 NEXT
86   1110 PRINT#2,CHR$(T%(ASC(T$)));
EA   1120 RETURN
54   1130 :
42   1140 :
27   1150 REM WAIT FOR ACK (WACK)
F3   1160 GET#2,A$
95   1170 IF A$<>CHR$(6) THEN 1160
2E   1180 RETURN
90   1190 :
8E   1200 :
39   1210 REM GETFUNCTION
CF   1220 GET#2,A$
14   1230 IF A$=CHR$(5) THEN C=1:RETURN
00   1240 GET A$
B6   1250 IF A$=CHR$(6) THEN C=2:RETURN
03   1260 IF A$=CHR$(26) THEN C=3:RETURN
A3   1270 IF A$=CHR$(3) THEN C=4:RETURN
2E   1280 GOTO 1210
35   1290 :
23   1300 :
AB   1310 REM GET ENQ MODE
AC   1320 GET#2,A$
A5   1330 IF A$=CHR$(1) THEN C=1:RETURN
CF   1340 IF A$=CHR$(26) THEN C=2:RETURN
64   1350 GOTO 1320
6F   1360 :
65   1370 :
4D   1380 REM GET FILENAME FROM RS232 SOH
5E   1390 GET#2,A$:IF A$="" THEN 1390
1C   1400 A=ASC(A$)
E4   1410 FOR X=1 TO A
B0   1420 GET#2,A$:IF A$=""THEN 1420
47   1430 FR$=FR$+CHR$(R%(ASC(A$)))
27   1440 NEXT
C3   1450 GET#2,T$:IF T$="" THEN 1450
3C   1460 E$=",S,W"
88   1470 T$=CHR$(R%(ASC(T$)))
D5   1480 IF T$="[SP]" OR T$="P" THEN E$=",P,W"
59   1490 RETURN
DB   1500 :
D1   1510 :
83   1520 REM TERMINAL MODE
94   1530 REM REMAIN IN TERMINAL MODE UNTIL
C3   1540 REM EITHER DLE FROM RS232
9C   1550 REM OF CTRL-C KEYSTROKE
24   1560 :
CA   1570 PRINT "[SE]NTERING TERMINAL MODE."
15   1580 GET#2,A$
16   1590 IF A$="" THEN 1620
BA   1600 IF A$=CHR$(16) THEN GOTO 1710
06   1610 PRINT CHR$(R%(ASC(A$)));
18   1620 GETA$
E3   1630 IF A$="" THEN 1580
48   1640 IF A$=CHR$(3) THEN GOTO 1680
B4   1650 PRINTA$;:PRINT#2,CHR$(T%(ASC(A$)));
A7   1660 GOTO 1580
B6   1670 :
3F   1680 REM CTRL-C KEYSTROKE
B2   1690 PRINT#2,CHR$(16);
90   1700 :
A1   1710 REM EXIT REQUEST RECEIVED
EA   1720 PRINT "[ST]ERMINAL MODE ENDS..."
46   1730 RETURN
E8   1740 :
E6   1750 :
01   1760 REM FILE TRANSMIT
22   1770 OPEN 3,8,3,FI$
25   1780 BL=1:SS=0
3E   1790 :
2D   1800 C=0:CH$="":BL$="":PRINT "BLOCK";BL;
5A   1810 GET#3,CH$:IF T$="T" THEN CH$=CHR$(T%(ASC(CH$)))
AC   1820 IF ST THEN FOR X=CH TO 128:BL$=BL$+CHR$(0):NEXT:SS=-1:GOTO 1850
8A   1830 BL$=BL$+CH$
63   1840 C=C+1:IF C<128 THEN 1810
0C   1850 PRINT#2,CHR$(2);
70   1860 PRINT#2,BL$;
07   1870 PRINT#2,CHR$(3);
2F   1880 PRINT ".128 BYTES";
83   1890 GOSUB 1150
6C   1900 PRINT ".[SO,SK]."
58   1910 IF NOT SS THEN BL=BL+1:GOTO 1800
BD   1920 :
3E   1930 PRINT#2,CHR$(4);
68   1940 CLOSE 3
EB   1950 RETURN    : REM BACK TO MAIN LOOP
95   1960 :
83   1970 :
0B   1980 REM RECEIVE FILE
EC   1990 PRINT "[SF]ILE ";FR$;" OF TYPE ";T$
77   2000 FI$=FR$+E$
51   2010 OPEN 3,8,3,FI$
78   2020 BL=1
CF   2030 :
38   2040 CH$="":BL$=""
D9   2050 GOSUB 2240:IF R$=CHR$(4) THEN 2190
A5   2060 IF R$<>CHR$(2) THEN 2050
A0   2070 PRINT "[SB]LOCK ";BL;".";
A1   2080 FOR X=1 TO 128
E0   2090 GET#2,CH$:IF LEN(CH$)=0 THEN CH$=CH$+CHR$(0)
F5   2100 IF T$="[ST]" OR T$="T" THEN CH$=CHR$(R%(ASC(CH$)))
E1   2110 BL$=BL$+CH$
D2   2120 NEXT
78   2130 GOSUB 2240:IF R$<>CHR$(3) THEN 2130
5C   2140 PRINT#3,BL$;" BYTES ";
DB   2150 BL=BL+1
B4   2160 GOSUB 900:PRINT ".[SO,SK].";LEN(BL$)
AD   2170 GOTO 2040
B6   2180 :
5B   2190 PRINT "[ST]RANSFER COMPLETE."
13   2200 CLOSE 3
1A   2210 RETURN   : REM BACK TO MAIN LOOP
8E   2220 :
B4   2230 :
CB   2240 REM WAIT FOR ETX OR EOT
A6   2250 GET#2,R$
CF   2260 IF R$=""THEN 2250
68   2270 RETURN
CA   2280 :
C0   2290 :
1F   2300 REM GET FILENAME FROM USER
74   2310 INPUT "[SF]ILENAME TO TRANSFER:";F$
57   2320 INPUT "(T)EXT ([SS,SE,SQ]) OR (P)ROGRAM ([SP,SR,SG])";T$
15   2330 E$=",S,R"
0C   2340 IF T$="P" THEN E$=",P,R"
31   2350 FI$=F$+E$:FL=LEN(F$)
CF   2360 RETURN
71   2370 :
6F   2380 :
A9   2390 REM SETUP TRANSLATION TABLES
FF   2400 PRINT "[SS]ETTING UP..."
D7   2410 DIM T%(255),R%(255)
F0   2420 FOR J=0 TO 64:T%(J)=J:NEXT
3A   2430 T%(10)=0:T%(20)=8
C3   2440 FOR J= 65 TO 90:K=J+32:T%(J)=K:NEXT
60   2450 FOR J=91 TO 95:T%(J)=J:NEXT
54   2460 FOR J=193 TO 218:K=J-128:T%(J)=K:NEXT
05   2470 T%(146)=16:T%(133)=16
22   2480 FOR J=0 TO 255
2C   2490 K=T%(J)
CF   2500 IF K<>0 THEN R%(K)=J:R%(K+128)=J
55   2510 NEXT
6F   2520 RETURN
4F   2530 GET A$
5A   2540 IF A$="" THEN 2530
64   2550 PRINT ASC(A$)
25   2560 GOTO 2530
```

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C16/Plus 4 Reference Book

A new book from ANCO may be just the thing that all C16 and Plus/4 owners have been waiting for.

By Stuart Cooke

Despite the fact that Commodore does not seem to be supporting the C16 and Plus/4 computers at all, the machines seem to be doing surprisingly well. The fact that it was possible to buy a Plus/4 for around £80 may have something to do with this.

Numerous software houses have now started producing good quality software for these machines and are doing very well for themselves. However, the problem occurs when a C16 or Plus/4 owner wants to start writing their own programs. Basic presents no problems, all the information that you require can be found in the manuals accompanying the computer.

Should you want to enter the world of machine code, and the world of professional computing then I'm afraid that it is a different story, there isn't much information about.

Anco is hoping to change all of this with a new book *C16/Plus 4 Reference Book*. To quote the manual: "The book contains all the essential information that you need to know when using your Plus/4 and C16. All the important aspects are explained in detail, the items already covered in the manual received with the computers have been omitted. The graphics and machine language are specially stressed and demonstrated with example programs".

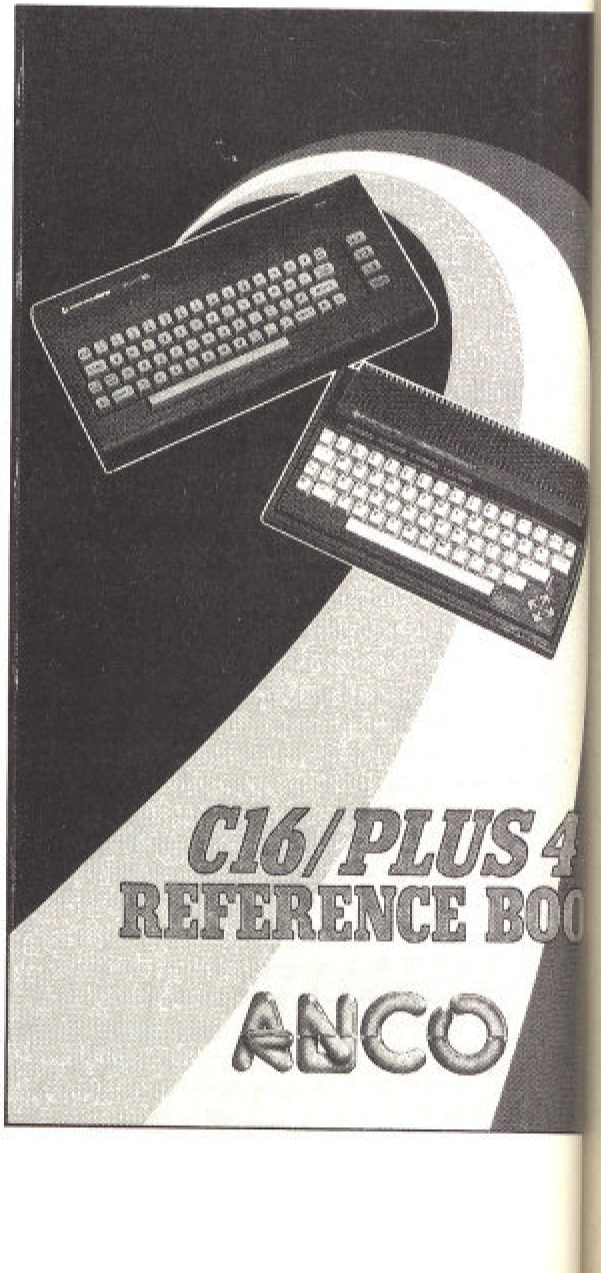
So does the book live up to its introduction?

The book comprises of five chapters each dealing with a specific subject. The first of these is graphics. The manual deals with the basics of graphics so with this little tome it's straight in with how to POKE graphics characters on to the screen, complete with screen memory map of course, an example of how to POKE characters is given and the whole section is easily understood by anyone who has a rudimentary knowledge of the computers. Following this the chapter goes on to discuss the possibility of user-defined character sets, again with a clearly documented program that redefines a character – it changes the sign to a degree symbol.

This chapter, though clear, shows that the book was probably rushed out on to the streets as there are quite a number of mistakes that should have been caught. For example, if you can make sense of the following sentence, which is, by the way, the first sentence in the section dealing with re-defined characters, you're a better person than I am: "As you have already learnt in chapter 2.1 the easiest and least memory space consumicccccphics possibility of the C-16 is the use of the existing characters."

But never mind, the rest of the section makes things clear and it is well worth reading.

Once low resolution graphics are out of the way, it's on into the world of high-res graphics, multi colour graphics and extended-colour graphics. Again the explanations are clear and concise and illustrated well



with a program. A machine code program to allow you to draw on the



screen with a joystick is given and this is used to illustrate some of the points.

Soft-scrolling of the screen (moving it up one pixel at a time) is dealt with briefly, though again in enough detail to give most programmers the information that they require and then it's on to the raster-interrupt. For those of you not sure what this is then I suggest that you go and buy the book, for those of you that do then you will be interested to learn that scrolling the screen is dealt with in detail complete with a program that allows you to scroll text on the screen with a joystick. All programs are given in both hex-dump format and assembly code when necessary, this means that you can read the assembly code to find out what the program is doing.

Music is the heading of the next chapter, getting your C16 and Plus/4 to play both in Basic and Machine code is covered. Firstly we have a Basic program that shows you just what is possible from Basic. Following this is a program illustrating how to make your computer play music on interrupts. This is one instance in the book that I felt that the author could have produced a better explanation of the program and how to use something similar in your own programs.

The Book then enters the world of machine code programming. The first section, entitled *Introduction to Machine Code*, tries to teach machine code in only 13 pages.

I realise that this isn't possible and that whole books have been written on the subject of machine code. However, this section is excellent, it probably won't make anyone a machine code genius but it will stop people from baulking at the sound of the term and will show them, again through examples, how to print something to the screen, how loops work etc.

A full description of the 7501 processors commands is given with the commands in alphabetical order with a description, their form of addressing, the assembler format, the number of bytes it occupies and how many machine cycles it takes to function.

A description on how to use the computers in-built kernal routines is given, together with a list of them all. Now you have no excuse for not knowing how to LOAD and SAVE programs in machine code, or how to get a character from the keyboard in a machine code program, all this and much more is dealt with again in an extremely clear way with the name of the routine being given, its address in the Kernal what registers are used etc. all being given.

An excellent memory map of the computers is given, extremely important if you wish to use machine code. The map could have done with some examples of how to use the various addresses to your own benefit as I am afraid that beginners to machine code will find the function of many of the addresses totally baffling. The more experienced programmer will no doubt find all of the information that he requires though and this section will undoubtedly become one of the most thumbed in the book. Maps of the TED chip and KERNAL jump table are also given which again will come in extremely useful.

If you have ever used a C64 then you will find the comparison of the memory maps of the C16 and C64 extremely useful. I know I did when I needed to find out where the border colour was stored on a C16. Its 53280 on the C64 but where on earth is it on a C16? This comparison will show you.

The final section of the book provides the reader with some machine code utilities ranging from a joystick scan routine to an OLD (restoring a NEWed program) routine. Accompanying this article is a sample section from this chapter of the book, I hope that this gives you a good idea of what is possible with this book.

5.3 TURBO MODE FOR THE C 16

For all those, who think the C 16 is too slow, we can show you a trick with which it will become about 30% faster. Since we live in a Turbo age, we simply call it the Turbo Mode. The trick is to switch the screen off. Of course this is impractical if you want to create Graphics and see them at the same time, but not if you have mathematical problems to solve, where you don't always have to look at the screen. The speed advantage arises from the fact that the Video-Chip TED doesn't slow down the Micro Processor anymore once the screen is switched off. A small demo program, first in Turbo Mode and then in the normal mode, will show you how it works and how much time you can save.

```
100 POKE 65286,PEEK(65286) AND 239
110 GOSUB 150
120 POKE 65286,PEEK(65286) OR 16
130 GOSUB 150
140 END
150 T=TI
160 FOR I=1 TO 1000
170 : B=B+1
180 NEXT I
190 PRINT USING "##.##";(TI-T)/60
200 RETURN
```

Verdict

I must admit I have been waiting for a book like this on the C16 and Plus/4 ever since the machines were first launched. OK so the book isn't perfect and there is room for a lot of improvement. However, the book does provide the advanced programmer with all of the reference material that he should ever require.

If you are into serious programming than I would suggest this is one book that you must go out and buy, it will become an invaluable, if not the most important book in your collection. YC

Touchline
Name: *C16/Plus 4 Reference Book* ***Price:*** *£7.95* ***Publisher:*** *Anco* ***Address:*** *Anco Software, 4 West Gate House, Spital Street, Dartford, Kent, DA1 2EH.* ***Tel:*** *0322 92513/92518* ***ISBN:*** *2-717-00101-5*

Tape Head Reader

Now you can find out more about how your programs are stored.

By D.A. Gardner

The main incentive for writing the program was the tedious wait involved in loading some types of program. I wanted to try and use Nick Hampshire's Fast-save routine (published in the February 1986 edition of *Your Commodore*) to make fast loading personal copies of any of my own programs. To do this I needed to be able to extract details of programs from their headers.

The Header-Reader program is quite simple and makes use of locations \$0333-\$0346 (819-836) which in the Plus/4 and C16 are used as a cassette tape buffer. Locations \$0333 and \$0334 give the start address of the program to be loaded, in low-byte high-byte form, and locations \$0335 and \$0336 give the end address. Locations \$0337 to \$0346 contain the 16 characters which make up the program name. The header is read by use of command OPEN 1 in line 10.

Line

1 Set up screen colours.

5 Clear screen, print title.

8 Instruction to position tape at header.

9 Get key press to continue.

10 Open Channel 1 to read header.

15 Clear screen, print title.

18-20 Print contents of locations 819-838 (\$0333-\$0346).

30 Translate locations \$0337 to \$0346 into filename and print.

40-60 Convert the low-byte high-byte address in locations \$0333 and \$0334 to give the start address of program in decimal and print.

70-90 Convert the low-byte high-byte address in locations \$0335 and \$0336 to give the end address of program in decimal and print.

92 Subtract the start address from the end address to give program length and print.

95 If the start address of the program is \$1001 this is often an indication that the program is Basic rather than a book of code. This line communicates that possibility.

96-98 Option of reading another header or terminating the program.

Variables

J\$ For GETKEY.

A\$ To contain the low-byte component of the hex start and end addresses.

B\$ To contain the high-byte component of the hex start and end addresses.

C\$ The combined high-byte start address.

D\$ The command high-byte low-byte end address.

S The decimal start address.

E The decimal end address.

I In FOR-NEXT loop.

YC

PROGRAM: TAPE HEADER

```
0 REM ** HEADER-READER BY D.GARD
NER **
1 COLOR0,16:COLOR4,6,4:COLOR1,1
5 SCNCLR:CHAR,12,0,"[RVSON]HEADE
R READER[RVSOFF]":PRINT
8 CHAR,0,5,"POSITION TAPE AND TH
EN PRESS ANY KEY[DOWN][DOWN]"
9 GETKEYJ$
10 OPEN1
15 SCNCLR:CHAR,12,0,"[RVSON]HEAD
ER READER[RVSOFF]":PRINT
18 PRINT"[DOWN]BYTES 819-838:":P
RINT
20 FORI=819TO838:PRINTPEEK(I);:N
EXTI
30 PRINT:PRINT"[DOWN]FILENAME IS
 ";:FORI=823TO838:PRINT"[RVSON]"
+CHR$(PEEK(I));:
NEXTI:PRINT"[RVSOFF]"
40 A$=HEX$(PEEK(820)):B$=HEX$(PE
EK(819))
50 C$=MID$(A$,3,2)+MID$(B$,3,2)
55 S=DEC(C$)
60 PRINT:PRINT"[DOWN]START ADDRE
SS  = ";S
70 A$=HEX$(PEEK(822)):B$=HEX$(PE
EK(821))
80 D$=MID$(A$,3,2)+MID$(B$,3,2)
85 E=DEC(D$)
90 PRINT"[DOWN]END ADDRESS     =
";E
92 PRINT"[DOWN]PROGRAM LENGTH =
";E-S
95 IFC$="1001"THENPRINT"[DOWN]PR
OGRAM IS PROBABLY BASIC":ELSEPRI
NT"[DOWN]PROGRAM
 IS PROBABLY CODE"
96 CHAR,6,22,"READ ANOTHER HEADE
R? (Y/N)"
97 GETKEYJ$:IFJ$<>"Y"ANDJ$<>"N"T
HEN97
98 IFJ$="Y"THENRUN5:ELSEEND
```

Animator

Graphics can play a key part in C64 programming especially if you have the right Our Animator should bring you one step closer to perfection.

By Allen Webb

Tanks to the speed available through computers, it is possible to achieve a wide range of graphical effects. As you will appreciate, the first system developed for animation involved the creation of a number of similar pictures which, when displayed in sequence, give an impression of movement.

Animator allows you to design, store and subsequently play back a sequence of 60 pictures. Depending on the delay used, the sequence can take from about two seconds to about 24 seconds.

So that you don't have to mess about with various utilities, the Animator program is self contained and provides options for:

1) Picture creation.
2) Play back of the sequence.
3) Saving and loading of files from tape or disk.
4) A character designer.

In order to keep the amount of typing to a minimum, I have taken two actions. Firstly, the package is in two parts, the editor/animation/data handling module and the character designer. These modules are almost completely independent except that:

1) If you load and run the editor/animator module alone, you must not use the design characters option.
2) The character designer cannot save or load character files itself – it relies on the facilities in the editor/animator module.

Secondly, I have left out a sprite option. I originally intended to allow you to overlay animated sprites on top of the animated backgrounds. I hope, in the near future, to write a third module offering this option which will use files created by these two modules.

Before I launch forth, let's consider what you might do with this package. When writing it, I had the younger user in mind. Most children like cartoons and the ability to easily create and manipulate animated sequences is equally appealing. Having said that, the system is also of use to the more serious user. It's very handy to be able to quickly create and mess about with sequences for use in games. As such, it provides an ideal test bench.

The modules are given in the two listings. Once you've typed them in, SAVE them. To create a stand-alone program, follow these steps:

1) Starting with a reset machine, type in the line:

```
10 SYS 2200
```

2) Input the instructions:

```
POKE 44,48: POKE 12288,0: NEW
```

in direct mode.

3) LOAD and RUN the main module loader.

4) LOAD and RUN the character designer loader.

5) Input the instruction:

```
POKE 44,8: POKE 45,200: POKE 46,34
```

in direct mode.

6) SAVE the program.

To ease the use of the program, a series of menus is used with prompts to the keys available as required. The RUN/STOP key is used throughout to return to the previous menu or to leave the program.

On running, you will see the main menu. This gives the options:

F1: Edit mode
F3: Animate mode
F5: Data manipulation
F7: Design characters

Pressing the relevant function key gives you the next menu.

Edit Mode

The edit menu gives the following options:

F1: Invert frame (this will only work properly if you are using a set of reverse field characters corresponding to the normal set in use)
F2: Save frame to RAM.
F3: Scroll mode. This gives a sub menu allowing charcter scrolling in four directions. The keys U,D,L and R perform these tasks.
F4: Recall frame from RAM.
F5: Graphics mode. This gives a sub menu with the options:
H: Switch to high resolution graphics.
M: Switch to multicolour mode.
E: Switch to extended mode.
1: Change background colour.

2,3,4: Change colour registers.
F6: Jump to next frame.
F7: Toggle key repeat.
F8: Set entire frame to current cursor colour.

Apart from these keys, there are controls for drawing the picture: Cursor keys, HOME and CLR act as usual but only within the frame. Control keys change cursor colours as usual. Reverse field can be toggled as usual. Press any key to place the relevant character on the current cursor position in the current cursor colour.

When you save a frame to RAM, both the characters and the colour of any frame are saved.

Animate Mode

This mode allows you to replay a specified sequence of frames. The menu shows the options:
F1: Set start frame
F3: Set finish frame
F5: Set delay between frames (1=fastest, 255=slowest)
F7: Run animation sequence

Data Mode

This allows the manipulation of data files.

The frames are saved in RAM as sequential blocks of data:

Characters	Colours	Characters	Colours ... etc
frame 1	frame 1	frame 2	frame 2

F1 allows you to save a block of frames to disk or tape. Because the full 59 frames occupy a lot of storage space, you can specify how many frames you save by setting the last frame in use.

F5 saves the block $3000 to $3FFF. This is used by the character designer to hold your redefined characters.

F7 loads either pictures or characters to the correct address.

Character Designer

This module can be used independently but you will need a machine code monitor or similar to SAVE or LOAD the characters. If you use it in this way, you enter the program by SYS 6704.

The designer screen has a number of features:
1) Along the top, the character set is displayed. The current charcter flashes.
2) The bottom few lines show the key options.
3) In the middle is the edit window. This shows the shape of the current character.
4) To the right of the edit window are shown the colours currently in the colour registers. These are shown as numbers beside a representation of the relevant bit pairs.
5) Below the colours is a second window. On start-up, this is a single character. This can be expanded to give a six by six array of characters. This allows the design of large designs.

The operative keys are:
CTRL-N: This switches on redefined characters and down loads the character set. You must use this command before you can start work on new characters.
+: Move to the next character
–: move to the previous character
M: switch to multi-colour mode
N: switch to high-resolution mode
C: copy the character specified by the next key pressed
G: move to the character specified by the next key pressed
R: reverse the current character
: flip the current character, left to right
S: rotate the current character
CTRL-R: switch on key repeat
CTRL-O: switch of key repeat
F1: scroll current character horizontally
F3: scroll current character vertically
X: expand window horizontally
Y: expand window vertically
CTRL-X: reduce window horizontally
: reduce window vertically
W: Update window to start at current character
***:** set a point in the character and move the cursor horizontally to next point
Z: set a point in the character and move the cursor vertically to next point
SPACE: clear a point in the character and move the cursor horizontally to next point
CTRL-Z: clear a point in the character and move the cursor verticallt point

The cursor keys, HOME and CLEAR act as normal except that they act on the edit window
1,2,3: change colour registers (1=cursor)

I know that the range of key presses is large but I'm sure that you'll find the program easy to use.

To help you through the system, here is a simple work session.

On running the program, you see the main menu. Press F7 to enter the character editor. Press CTRL-N to activate the defineable character set. You should see the rubbish in the edit area change to a giant "@" character. OK? try some of the keys to change the shape of the design. You will see that each action is mirrored in the normal flashing "@" at the top of the screen. Move on to the next character ("A") by pressing + and redesign that. Once you've got a few redefined characters, press RUN/STOP once to return to the main menu.

Press F1 to enter edit mode. You should see a cursor flashing in a rectangular area of screen. The prompt line should show you that you are set up for screen 1. Press F4. The edit area should be filled with garbage. You've just recalled screen 1 from RAM. Press shift-CLR followed by F8. This clears the edit area and sets it's colour to white (the current colour). Press a few keys. You should get the character corresponding to the keys pressed. Press F3 to enter scroll mode. You will see a prompt line showing which keys operate. Press a few and see what happens. Press RUN/STOP to return to the edit mode. Press F5 and have a quick dabble with the colours and graphics modes. When you've designed screen 1, press F2 to save it to RAM. Always save the screen before leaving edit mode or you'll lose the design. Clear the screen and press F4. You should see your design again. Move onto the next frame by pressing F6. The edit screen content are retained so that you don't have to redraw it. Try drawing and saving a few screens. Press RUN/STOP to return to the main menu.

Press F3 to enter animate mode. Set the start frame to your first frame (F1) and the finish frame (F3) to your last frame. Try playing the sequence at different delay speeds. Press RUN/STOP to exit to the main menu.

Press F5 to enter the data storage mode. Try saving and reloading your character set and animation sequence. To exit from the program, press RUN/STOP when at the main menu. YC

```
PROGRAM: MAIN.LOADER
```

Please read 'LISTINGS' before entering program.

```
61  10 REM *********************
    *
E4  20 REM *  ANIMATION SYSTEM
    *
51  30 REM *    MAIN SEGMENT
    *
BE  40 REM *      AEW 1986
    *
E9  50 REM *********************
    *
6C  60 FORL=0TO281:CX=0:FORD=0TO
    15:READA:CX=CX+A:POKE2200+L*
    16+D,A:NEXTD
05  70 READA:IFA<>CXTHENPRINT"ER
    ROR IN LINE";2040+(L*10):STO
    P
A4  80 NEXTL:END
C1  90 DATA76,155,8,169,0,141,32
    ,208,141,33,208,169,1,141,14
    2,3,1627
54  100 DATA141,139,3,141,143,3,
    141,144,3,141,145,3,141,146,
    3,169,1606
7C  110 DATA147,32,210,255,169,1
    28,141,138,2,169,147,32,210,
    255,32,100,2167
17  120 DATA18,32,228,255,240,25
    1,201,133,208,6,32,251,8,76,
    193,8,2140
1F  130 DATA201,134,208,6,32,26,
    21,76,193,8,201,135,208,6,32
    ,76,1563
B2  140 DATA22,76,193,8,201,136,
    208,6,32,48,26,76,193,8,201,
    3,1437
DF  150 DATA208,207,96,169,1,141
    ,142,3,32,90,11,32,255,24,32
    ,37,1480
FD  160 DATA15,32,170,15,32,222,
    15,169,0,141,136,3,76,248,9,
    162,1445
F8  170 DATA0,142,134,3,201,32,1
    44,8,201,128,144,9,201,160,1
    76,5,1688
E8  180 DATA162,1,142,134,3,96,1
    69,90,133,251,169,4,133,252,
    162,0,1901
A4  190 DATA160,0,173,137,3,201,
    1,240,11,201,2,240,16,169,32
    ,145,1731
AD  200 DATA251,76,101,9,177,251
    ,73,128,145,251,76,101,9,165
    ,251,133,2197
6F  210 DATA167,24,165,252,105,2
    12,133,168,173,139,3,145,167
    ,200,192,20,2265
A7  220 DATA208,208,24,165,251,1
    05,40,133,251,165,252,105,0,
    133,252,232,2524
07  230 DATA224,10,208,188,96,32
    ,228,255,208,9,32,32,11,32,3
    2,11,1608
00  240 DATA76,125,9,96,32,125,9
    ,32,23,9,172,134,3,240,3,76,
    1164
D8  250 DATA197,9,201,64,176,5,1
    62,0,76,183,9,201,96,176,5,1
    62,1722
54  260 DATA64,76,183,9,201,192,
    176,5,162,64,76,183,9,162,12
    8,142,1832
9E  270 DATA141,3,56,237,141,3,1
    72,136,3,240,2,9,128,96,169,
    0,1536
20  280 DATA133,253,133,254,172,
    133,3,192,0,240,16,24,165,25
    3,105,40,2116
C1  290 DATA133,253,165,254,105,
    0,133,254,136,208,240,24,165
    ,253,109,132,2564
DA  300 DATA3,133,253,133,167,16
    5,254,105,4,133,254,105,212,
    133,168,96,2318
14  310 DATA169,10,141,132,3,169
    ,2,141,133,3,32,103,25,32,19
    8,9,1302
73  320 DATA32,140,9,172,134,3,2
    08,12,160,0,145,253,173,139,
    3,145,1728
0C  330 DATA167,76,172,10,201,13
    8,208,6,32,91,17,76,2,10,201
    ,136,1543
48  340 DATA208,6,32,202,16,76,2
    ,10,201,137,208,6,32,84,17,7
    6,1313
6A  350 DATA2,10,201,29,208,3,76
    ,172,10,201,139,208,6,32,235
    ,17,1549
49  360 DATA76,2,10,201,157,240,
    111,201,17,240,125,201,145,2
    08,3,76,2013
14  370 DATA226,10,201,19,240,15
    4,201,147,208,3,76,10,11,201
    ,18,208,1933
D3  380 DATA3,76,244,10,201,146,
    208,3,76,255,10,201,133,208,
    3,76,1853
DD  390 DATA21,11,201,140,208,3,
    76,244,12,201,134,208,3,76,1
    23,13,1674
C1  400 DATA201,135,208,3,76,205
    ,13,160,0,217,255,12,240,8,2
    00,192,2125
0A  410 DATA16,208,246,76,164,10
    ,140,139,3,76,2,10,201,3,240
    ,3,1537
9F  420 DATA76,2,10,96,238,132,3
    ,173,132,3,201,29,144,5,169,
    29,1442
11  430 DATA141,132,3,76,2,10,20
    6,132,3,173,132,3,201,9,208,
    5,1436
ED  440 DATA169,10,141,132,3,76,
    2,10,238,133,3,173,133,3,201
    ,11,1438
F2  450 DATA144,5,169,11,141,133
    ,3,76,2,10,206,133,3,173,133
    ,3,1345
A9  460 DATA201,1,208,5,169,2,14
    1,133,3,76,2,10,169,1,141,13
    6,1398
65  470 DATA3,32,170,15,76,2,10,
    169,0,141,136,3,32,170,15,76
    ,1050
36  480 DATA2,10,169,0,141,137,3
    ,32,46,9,76,248,9,169,1,141,
    1193
17  490 DATA137,3,32,46,9,76,2,1
    0,160,0,177,253,141,135,3,44
    ,1228
A7  500 DATA135,3,16,9,177,253,4
    1,127,145,253,76,59,11,177,2
    53,9,1744
B3  510 DATA128,145,253,32,63,11
    ,96,160,50,162,50,202,208,25
    3,136,208,2157
D4  520 DATA248,96,160,0,169,32,
    153,48,6,153,12,7,200,192,22
    0,208,1904
90  530 DATA245,96,162,14,160,0,
    24,32,240,255,169,158,160,11
    ,32,30,1788
6F  540 DATA171,169,201,160,11,3
    2,30,171,169,244,160,11,32,3
    0,171,169,1931
04  550 DATA30,160,12,32,30,171,
    169,72,160,12,32,30,171,169,
    114,160,1524
82  560 DATA12,32,30,171,169,159
    ,160,12,32,30,171,169,201,16
    0,12,32,1552
10  570 DATA30,171,32,254,17,96,
    18,158,29,29,32,32,32,32,32,
    32,1026
35  580 DATA32,32,32,32,32,32,32
    ,69,68,73,84,79,82,32,77,79,
    867
BC  590 DATA68,69,32,32,32,32,32
    ,32,32,32,32,32,32,32,32,13,
    566
98  600 DATA0,32,32,18,159,70,49
    ,46,46,73,78,86,69,82,84,32,
    956
88  610 DATA87,73,78,68,79,87,32
    ,32,70,50,46,46,83,65,86,69,
    1051
15  620 DATA32,70,82,65,77,69,32
    ,32,32,32,13,0,32,32,18,70,6
    88
FC  630 DATA51,46,46,83,67,82,79
    ,76,76,32,77,79,68,69,32,32,
    995
DB  640 DATA32,32,70,52,46,46,71
    ,69,84,32,70,82,65,77,69,32,
    929
AF  650 DATA32,32,32,32,13,0,32,
    32,18,70,53,46,46,71,82,65,6
    56
A7  660 DATA80,72,73,67,83,32,77
    ,79,68,69,32,32,70,54,46,46,
    980
E5  670 DATA65,68,86,65,78,67,69
    ,32,70,82,65,77,69,32,13,0,9
    38
1B  680 DATA32,32,18,70,55,46,46
    ,75,69,89,32,82,69,80,69,65,
    929
51  690 DATA84,32,32,32,32,32,70
    ,56,46,46,67,76,69,65,82,32,
    853
2C  700 DATA67,79,76,79,85,82,83
    ,32,13,0,32,32,18,32,32,32,7
    74
34  710 DATA32,32,32,32,32,32,32
    ,32,32,32,18,28,82,47,83,32,
    610
DD  720 DATA84,79,32,69,88,73,84
    ,159,32,32,32,32,32,32,32,32
    ,924
04  730 DATA32,32,32,32,32,13,0,
    146,32,32,32,32,32,32,32,32,
    575
4D  740 DATA32,32,32,32,32,32,32
    ,32,32,32,32,32,32,32,32,32,
    512
5E  750 DATA32,32,32,32,32,32,32
    ,32,32,32,32,32,32,32,32,13,
    493
49  760 DATA0,32,32,18,159,32,32
    ,32,32,32,32,32,32,32,32,32,
    593
3C  770 DATA32,32,32,32,32,32,32
    ,32,32,32,32,32,32,32,32,32,
    512
D0  780 DATA32,32,32,32,32,32,32
    ,32,32,32,13,0,169,2,141,137
    ,782
21  790 DATA3,32,46,9,76,2,10,14
    4,5,28,159,156,30,31,158,129
    ,1018
B0  800 DATA149,150,151,152,153,
    154,155,169,90,133,251,169,4
    ,133,252,32,2297
F7  810 DATA122,16,162,0,160,1,1
    77,251,72,177,167,136,145,16
    7,104,145,2002
D2  820 DATA251,200,200,192,20,2
    08,239,136,169,32,145,251,17
    3,139,3,145,2503
D8  830 DATA167,32,108,16,32,122
    ,16,232,224,10,208,216,96,16
    9,89,133,1870
9C  840 DATA251,169,4,133,252,32
    ,122,16,162,0,160,19,177,251
    ,72,177,1997
C8  850 DATA167,200,145,167,104,
    145,251,136,136,192,0,208,23
    9,200,169,32,2491
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51  860 DATA145,251,173,134,2,14
    5,167,32,108,16,32,122,16,23
    2,224,10,1809
AF  870 DATA208,216,96,32,177,14
    ,169,2,141,32,208,32,228,255
    ,240,251,2301
F8  880 DATA201,76,208,11,32,15,
    13,76,131,13,240,37,76,131,1
    3,201,1474
E4  890 DATA82,208,6,32,69,13,76
    ,131,13,201,68,208,6,32,18,1
    6,1179
1B  900 DATA76,131,13,201,85,208
    ,6,32,134,16,76,131,13,201,3
    ,208,1534
33  910 DATA202,169,0,141,32,208
    ,32,121,14,32,170,15,32,222,
    15,32,1437
2F  920 DATA254,17,76,2,10,32,23
    5,14,169,5,141,32,208,32,228
    ,255,1710
AD  930 DATA240,251,201,72,240,6
    1,201,77,240,70,201,69,240,4
    0,201,49,2453
3E  940 DATA240,75,201,50,240,88
    ,201,51,240,101,201,52,240,1
    14,201,3,2298
D7  950 DATA208,219,169,0,141,32
    ,208,32,121,14,32,170,15,32,
    222,15,1630
C1  960 DATA32,254,17,76,2,10,16
    9,8,141,22,208,169,91,141,17
    ,208,1565
C9  970 DATA76,205,13,169,27,141
    ,17,208,169,8,141,22,208,76,
    205,13,1698
C1  980 DATA169,24,141,22,208,16
    9,27,141,17,208,76,205,13,23
    8,33,208,1899
CC  990 DATA173,33,208,41,15,141
    ,33,208,32,255,24,76,205,13,
    238,34,1729
CF  1000 DATA208,173,34,208,41,1
    5,141,34,208,32,255,24,76,20
    5,13,238,1905
35  1010 DATA35,208,173,35,208,4
    1,15,141,35,208,32,255,24,76
    ,205,13,1704
0C  1020 DATA238,36,208,173,36,2
    08,41,15,141,36,208,32,255,2
    4,76,205,1932
10  1030 DATA13,162,21,160,2,24,
    32,240,255,169,137,160,14,32
    ,30,171,1622
AC  1040 DATA96,18,159,32,32,32,
    32,32,32,32,32,32,32,32,32,3
    2,689
45  1050 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,512
AF  1060 DATA32,32,32,32,32,32,3
    2,32,0,162,21,160,2,24,32,24
    0,897
42  1070 DATA255,169,193,160,14,
    32,30,171,96,18,156,32,32,32
    ,32,32,1454
6F  1080 DATA85,32,32,32,32,32,6
    8,32,32,32,32,32,76,32,32,32
    ,645
CA  1090 DATA32,32,82,32,32,32,3
    2,32,82,47,83,32,32,32,32,32
    ,678
19  1100 DATA146,13,0,162,21,160
    ,2,24,32,240,255,169,251,160
    ,14,32,1681
90  1110 DATA30,171,96,18,156,32
    ,32,32,32,72,32,32,32,77,32,
    32,908
07  1120 DATA32,69,32,32,49,32,3
    2,50,32,32,51,32,32,52,32,32
    ,623
7C  1130 DATA32,82,47,83,32,32,3
    2,32,32,32,146,13,0,162,1,16
    0,918
A2  1140 DATA9,24,32,240,255,169
    ,99,160,15,32,30,171,169,2,1
    41,137,1685
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AC  1150 DATA3,174,137,3,160,9,2
    4,32,240,255,169,124,160,15,
    32,30,1567
C6  1160 DATA171,238,137,3,173,1
    37,3,201,12,208,230,162,12,1
    60,9,24,1880
1E  1170 DATA32,240,255,169,147,
    160,15,32,30,171,96,30,146,1
    76,192,192,2083
AF  1180 DATA192,192,192,192,192
    ,192,192,192,192,192,192,192
    ,192,192,192,192,3072
C1  1190 DATA192,192,174,0,221,3
    2,32,32,32,32,32,32,32,32,32
    ,32,1131
B8  1200 DATA32,32,32,32,32,32,3
    2,32,32,221,0,173,192,192,19
    2,192,1450
C5  1210 DATA192,192,192,192,192
    ,192,192,192,192,192,192,192
    ,192,192,192,192,3072
1D  1220 DATA189,0,162,21,160,3,
    24,32,240,255,173,136,3,240,
    8,169,1815
8D  1230 DATA199,160,15,32,30,17
    1,96,169,211,160,15,32,30,17
    1,96,159,1746
31  1240 DATA18,82,69,86,32,79,7
    8,32,19,146,0,159,18,82,69,8
    6,1055
B5  1250 DATA32,79,70,70,146,0,1
    62,21,160,12,24,32,240,255,1
    73,138,1614
13  1260 DATA2,240,8,169,251,160
    ,15,32,30,171,96,169,7,160,1
    6,32,1558
39  1270 DATA30,171,96,159,18,82
    ,69,80,69,65,84,32,19,146,0,
    18,1138
8F  1280 DATA159,83,73,78,71,76,
    69,32,146,0,160,0,162,0,169,
    154,1432
70  1290 DATA133,251,169,5,133,2
    52,32,122,16,177,251,141,135
    ,3,177,167,2164
55  1300 DATA141,138,3,32,108,16
    ,32,122,16,173,138,3,145,167
    ,173,135,1542
36  1310 DATA3,145,251,32,94,16,
    32,94,16,32,122,16,232,224,9
    ,208,1526
FD  1320 DATA216,32,108,16,32,12
    2,16,169,32,145,251,173,139,
    3,145,167,1766
43  1330 DATA200,192,20,208,183,
    96,56,165,251,233,40,133,251
    ,165,252,233,2678
7E  1340 DATA0,133,252,96,24,165
    ,251,105,40,133,251,165,252,
    105,0,133,2105
20  1350 DATA252,96,24,165,251,1
    33,167,165,252,105,212,133,1
    68,96,160,0,2379
0B  1360 DATA162,0,169,130,133,2
    51,169,4,133,252,32,122,16,1
    77,251,72,2073
BB  1370 DATA177,167,72,32,94,16
    ,32,122,16,104,145,167,104,1
    45,251,32,1676
E9  1380 DATA108,16,32,108,16,32
    ,122,16,232,224,9,208,224,32
    ,94,16,1489
D0  1390 DATA32,122,16,169,32,14
    5,251,173,139,3,145,167,200,
    192,20,208,2014
F7  1400 DATA191,96,173,138,2,20
    1,128,240,9,169,128,141,138,
    2,32,222,2010
F6  1410 DATA15,96,169,0,141,138
    ,2,32,222,15,96,169,90,133,2
    51,169,1738
5C  1420 DATA4,133,252,32,69,18,
    162,0,142,140,3,160,0,177,25
    1,140,1683
C3  1430 DATA135,3,172,140,3,145
    ,253,238,140,3,238,135,3,172
    ,135,3,1918
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AD  1440 DATA192,20,208,233,232,
    32,108,16,224,10,208,223,96,
    169,90,133,2194
E8  1450 DATA251,169,216,133,252
    ,32,69,18,24,165,253,105,200
    ,133,253,165,2438
CC  1460 DATA254,105,0,133,254,1
    62,0,142,140,3,160,0,177,251
    ,140,135,2056
2F  1470 DATA3,172,140,3,145,253
    ,238,140,3,238,135,3,172,135
    ,3,192,1975
73  1480 DATA20,208,233,232,32,1
    08,16,224,10,208,223,96,32,2
    27,16,32,1917
FB  1490 DATA21,17,96,32,100,17,
    32,161,17,96,162,255,169,90,
    133,251,1649
76  1500 DATA169,4,133,252,32,69
    ,18,169,54,133,1,162,0,142,1
    40,3,1481
F6  1510 DATA160,0,140,135,3,172
    ,140,3,177,253,172,135,3,145
    ,251,238,2127
36  1520 DATA140,3,238,135,3,173
    ,135,3,201,20,208,233,232,32
    ,108,16,1880
DA  1530 DATA224,10,208,220,169,
    55,133,1,96,169,90,133,251,1
    69,216,133,2277
14  1540 DATA252,32,69,18,24,165
    ,253,105,200,133,253,165,254
    ,105,0,133,2161
7A  1550 DATA254,169,54,133,1,16
    2,0,142,140,3,160,0,140,135,
    3,172,1668
5C  1560 DATA140,3,177,253,172,1
    35,3,145,251,238,140,3,238,1
    35,3,173,2209
56  1570 DATA135,3,201,20,208,23
    3,232,32,108,16,224,10,208,2
    20,169,55,2074
72  1580 DATA133,1,96,238,142,3,
    173,142,3,201,60,208,5,169,1
    ,141,1716
79  1590 DATA142,3,32,254,17,96,
    162,21,160,29,24,32,240,255,
    169,22,1658
BE  1600 DATA160,18,32,30,171,16
    9,0,174,142,3,32,205,189,96,
    18,159,1598
5F  1610 DATA70,82,65,77,69,58,3
    2,32,32,32,157,157,157,0,169
    ,0,1189
6A  1620 DATA133,253,169,160,133
    ,254,172,142,3,136,240,16,24
    ,165,253,105,2358
F3  1630 DATA200,133,253,165,254
    ,105,0,133,254,136,208,240,9
    6,169,0,133,2479
C1  1640 DATA253,169,64,133,254,
    172,142,3,136,240,16,24,165,
    253,105,144,2273
39  1650 DATA133,253,165,254,105
    ,1,133,254,136,208,240,96,32
    ,128,24,162,2324
E6  1660 DATA14,160,0,24,32,240,
    255,169,154,160,18,32,30,171
    ,169,197,1825
D6  1670 DATA160,18,32,30,171,16
    9,240,160,18,32,30,171,169,2
    6,160,19,1605
98  1680 DATA32,30,171,169,68,16
    0,19,32,30,171,169,110,160,1
    9,32,30,1402
23  1690 DATA171,96,18,158,29,29
    ,32,32,32,32,32,32,32,32,32,
    32,821
1D  1700 DATA32,32,32,32,77,65,7
    3,78,32,77,69,78,85,32,32,32
    ,858
7C  1710 DATA32,32,32,32,32,32,3
    2,32,32,32,32,13,0,32,32,18,
    447
08  1720 DATA159,70,49,46,46,69,
    68,73,84,32,77,79,68,69,32,3
    2,1053
```

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93  1730 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,512
18  1740 DATA32,32,32,32,32,32,1
    3,0,32,32,18,70,51,46,46,65,
    565
04  1750 DATA78,73,77,65,84,69,3
    2,77,79,68,69,32,32,32,32,32
    ,931
4D  1760 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,512
12  1770 DATA13,0,32,32,18,70,53
    ,46,46,68,65,84,65,32,77,65,
    766
2A  1780 DATA78,73,80,85,76,65,8
    4,73,79,78,32,32,32,32,32,32
    ,963
2E  1790 DATA32,32,32,32,32,32,3
    2,32,32,32,13,0,32,32,18,70,
    485
5C  1800 DATA55,46,46,68,69,83,7
    3,71,78,32,67,72,65,82,65,67
    ,1039
D7  1810 DATA84,69,82,83,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,702
DF  1820 DATA32,32,32,32,13,0,32
    ,32,18,32,32,32,32,32,32,32,
    447
AD  1830 DATA32,32,32,32,32,32,1
    8,28,82,47,83,32,84,79,32,69
    ,746
26  1840 DATA88,73,84,159,32,32,
    32,32,32,32,32,32,32,32,32,3
    2,788
1F  1850 DATA32,13,0,18,158,29,2
    9,32,32,32,32,32,32,32,32,32
    ,567
B3  1860 DATA32,32,32,65,78,73,7
    7,65,84,69,32,77,79,68,69,32
    ,964
51  1870 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,13,0,32,32,
    461
83  1880 DATA18,159,70,49,46,46,
    83,69,84,32,83,84,65,82,84,3
    2,1086
0B  1890 DATA70,82,65,77,69,32,3
    2,32,32,32,32,32,32,32,32,32
    ,715
9B  1900 DATA32,32,32,32,32,32,3
    2,13,0,32,32,18,70,51,46,46,
    532
54  1910 DATA83,69,84,32,70,73,7
    8,73,83,72,32,70,82,65,77,69
    ,1112
BA  1920 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,512
1B  1930 DATA32,13,0,32,32,18,70
    ,53,46,46,83,69,84,32,68,69,
    747
30  1940 DATA76,65,89,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,646
F7  1950 DATA32,32,32,32,32,32,3
    2,32,32,32,32,13,0,32,32,18,
    447
63  1960 DATA70,55,46,46,82,85,7
    8,32,83,69,81,85,69,78,67,69
    ,1095
10  1970 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,512
5F  1980 DATA32,32,32,32,32,13,0
    ,32,32,18,32,32,32,32,32,32,
    447
94  1990 DATA32,32,32,32,32,32,3
    2,18,28,82,47,83,32,84,79,32
    ,709
2E  2000 DATA69,88,73,84,159,32,
    32,32,32,32,32,32,32,32,32,3
    2,825
BB  2010 DATA32,32,13,0,162,21,1
    60,0,24,32,240,255,169,218,1
    60,20,1538
E7  2020 DATA32,30,171,169,0,174
    ,143,3,32,205,189,169,240,16
    0,20,32,1769
DE  2030 DATA30,171,169,0,174,14
    4,3,32,205,189,162,22,160,16
    ,24,32,1533
3D  2040 DATA240,255,169,12,160,
    21,32,30,171,169,0,174,145,3
    ,32,205,1818
2A  2050 DATA189,96,32,32,83,84,
    65,82,84,32,70,82,65,77,69,5
    8,1200
AE  2060 DATA32,32,32,32,157,157
    ,157,0,32,32,32,32,32,32,32,
    70,893
76  2070 DATA73,78,73,83,72,32,7
    0,82,65,77,69,58,32,32,32,32
    ,960
90  2080 DATA157,157,157,0,68,69
    ,76,65,89,58,32,32,32,32,157
    ,157,1338
34  2090 DATA157,0,169,147,32,21
    0,255,162,14,160,0,24,32,240
    ,255,169,2026
13  2100 DATA155,160,19,32,30,17
    1,169,198,160,19,32,30,171,1
    69,241,160,1916
C2  2110 DATA19,32,30,171,169,27
    ,160,20,32,30,171,169,69,160
    ,20,32,1311
23  2120 DATA30,171,169,111,160,
    20,32,30,171,32,156,20,32,22
    8,255,240,1857
B5  2130 DATA251,201,3,240,49,20
    1,133,208,9,32,143,21,32,156
    ,20,76,1775
14  2140 DATA84,21,201,134,208,9
    ,32,159,21,32,156,20,76,84,2
    1,201,1459
4F  2150 DATA135,208,9,32,175,21
    ,32,194,20,76,84,21,201,136,
    208,6,1558
4D  2160 DATA32,184,21,76,84,21,
    96,238,143,3,173,143,3,201,6
    0,208,1686
17  2170 DATA5,169,1,141,143,3,9
    6,238,144,3,173,144,3,201,60
    ,208,1732
7F  2180 DATA5,169,1,141,144,3,9
    6,238,145,3,240,251,32,194,2
    0,96,1778
F1  2190 DATA173,143,3,205,144,3
    ,176,32,141,142,3,173,144,3,
    141,141,1767
11  2200 DATA3,238,141,3,32,91,1
    7,32,238,21,32,225,21,238,14
    2,3,1477
D7  2210 DATA173,142,3,205,141,3
    ,208,236,96,174,145,3,172,14
    5,3,136,1985
9E  2220 DATA208,253,202,208,247
    ,96,162,24,160,0,24,32,240,2
    55,169,6,2286
8B  2230 DATA160,22,32,30,171,16
    9,0,174,142,3,32,205,189,96,
    18,5,1448
54  2240 DATA67,85,82,82,69,78,8
    4,32,70,82,65,77,69,46,46,14
    6,1180
5E  2250 DATA32,32,32,32,157,157
    ,157,0,32,245,22,32,36,23,17
    4,126,1289
62  2260 DATA24,169,0,160,0,32,1
    86,255,173,127,24,162,0,160,
    2,32,1506
7C  2270 DATA189,255,169,0,133,1
    80,169,48,133,181,169,180,16
    2,255,160,63,2446
24  2280 DATA32,216,255,96,169,1
    47,32,210,255,162,14,160,0,2
    4,32,240,2044
81  2290 DATA255,169,82,160,23,3
    2,30,171,169,125,160,23,32,3
    0,171,169,1801
8D  2300 DATA168,160,23,32,30,17
    1,169,210,160,23,32,30,171,1
    69,252,160,1960
45  2310 DATA23,32,30,171,32,228
    ,255,240,251,201,3,240,30,20
    1,133,208,2278
1E  2320 DATA6,32,164,22,76,76,2
    2,201,134,208,6,32,213,22,76
    ,76,1366
23  2330 DATA22,201,135,208,223,
    32,32,22,76,76,22,96,32,245,
    22,32,1476
DF  2340 DATA36,23,32,219,25,174
    ,126,24,169,0,160,0,32,186,2
    55,173,1634
E0  2350 DATA127,24,162,0,160,2,
    32,189,255,169,0,133,180,169
    ,64,133,1799
2D  2360 DATA181,169,180,174,147
    ,3,172,148,3,32,216,255,96,3
    2,245,22,2075
51  2370 DATA32,36,23,169,1,174,
    126,24,160,1,32,186,255,173,
    127,24,1543
9F  2380 DATA162,0,160,2,32,189,
    255,169,0,32,213,255,96,162,
    19,160,1906
DF  2390 DATA0,24,32,240,255,169
    ,41,160,24,32,30,171,32,228,
    255,240,1933
E0  2400 DATA251,201,49,144,247,
    201,58,176,243,32,210,255,56
    ,233,48,141,2545
26  2410 DATA126,24,32,228,255,2
    40,251,201,13,208,210,96,162
    ,19,160,0,2225
D9  2420 DATA24,32,240,255,169,6
    8,160,24,32,30,171,160,0,32,
    207,255,1859
67  2430 DATA201,13,240,7,153,0,
    2,200,76,53,23,192,16,144,2,
    160,1482
40  2440 DATA16,140,127,24,169,1
    3,32,210,255,96,18,158,29,29
    ,32,32,1380
55  2450 DATA32,32,32,32,32,32,3
    2,32,32,32,68,65,84,65,32,72
    ,706
CA  2460 DATA65,78,68,76,73,78,7
    1,32,32,32,32,32,32,32,32,32
    ,797
D0  2470 DATA32,32,32,13,0,32,32
    ,18,159,70,49,46,46,83,65,86
    ,795
60  2480 DATA69,32,80,73,67,84,8
    5,82,69,83,32,32,32,32,32,32
    ,916
B9  2490 DATA32,32,32,32,32,32,3
    2,32,32,32,32,32,32,32,13,0,
    461
00  2500 DATA32,32,18,70,51,46,4
    6,76,79,65,68,32,65,32,70,73
    ,855
57  2510 DATA76,69,32,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,593
27  2520 DATA32,32,32,32,32,32,3
    2,32,13,0,32,32,18,70,53,46,
    520
B4  2530 DATA46,83,65,86,69,32,6
    7,72,65,82,65,67,84,69,82,32
    ,1066
6C  2540 DATA83,69,84,32,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,652
95  2550 DATA32,32,13,0,32,32,18
    ,32,32,32,32,32,32,32,32,32,
    447
80  2560 DATA32,32,32,32,18,28,8
    2,47,83,32,84,79,32,69,88,73
    ,843
82  2570 DATA84,159,32,32,32,32,
    32,32,32,32,32,32,32,32,32,1
    3,672
4E  2580 DATA0,5,83,84,79,82,65,
    71,69,32,68,69,86,73,67,69,1
    002
E4  2590 DATA32,63,32,32,32,32,3
    2,157,157,157,157,0,5,70,73,
    76,1107
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00  2600 DATA69,78,65,77,69,32,6
    3,32,32,32,32,32,32,32,32,15
    7,866
E7  2610 DATA157,157,157,157,157
    ,157,157,0,5,76,65,83,84,32,
    70,82,1596
45  2620 DATA65,77,69,63,32,32,3
    2,32,32,32,32,32,32,157,157,
    157,1033
D0  2630 DATA157,157,157,157,157
    ,0,0,0,169,147,32,210,255,16
    2,4,160,1924
1C  2640 DATA0,24,32,240,255,169
    ,163,160,24,32,30,171,169,19
    8,160,24,1851
E3  2650 DATA32,30,171,169,226,1
    60,24,32,30,171,96,29,29,29,
    29,29,1286
82  2660 DATA29,29,29,29,29,18,5
    ,67,66,77,32,65,78,73,77,65,
    768
F9  2670 DATA84,73,79,78,32,83,8
    9,83,84,69,77,146,13,0,29,29
    ,1048
41  2680 DATA29,29,29,29,29,29,2
    9,158,17,29,29,29,29,29,29,2
    9,581
DB  2690 DATA40,67,41,32,49,57,5
    6,54,13,0,29,29,29,29,29,29,
    583
F5  2700 DATA29,29,29,159,17,29,
    29,29,29,29,29,65,76,76,69,7
    8,801
DB  2710 DATA32,87,69,66,66,13,0
    ,162,4,160,0,24,32,240,255,1
    69,1379
DB  2720 DATA130,160,25,32,30,17
    1,173,33,208,41,15,170,169,0
    ,32,205,1594
6B  2730 DATA189,162,8,160,0,24,
    32,240,255,169,162,160,25,32
    ,30,171,1819
7D  2740 DATA173,34,208,41,15,17
    0,169,0,32,205,189,162,9,160
    ,0,24,1591
3E  2750 DATA32,240,255,169,176,
    160,25,32,30,171,173,35,208,
    41,15,170,1932
26  2760 DATA169,0,32,205,189,16
    2,10,160,0,24,32,240,255,169
    ,190,160,1997
FB  2770 DATA25,32,30,171,173,36
    ,208,41,15,170,169,0,32,205,
    189,162,1658
EE  2780 DATA11,160,0,24,32,240,
    255,169,204,160,25,32,30,171
    ,173,139,1825
47  2790 DATA3,41,15,170,169,0,3
    2,205,189,96,146,5,67,85,82,
    82,1387
CF  2800 DATA69,78,84,13,67,79,7
    6,79,85,82,83,13,13,67,79,76
    ,1043
AF  2810 DATA66,58,32,32,32,32,1
    57,157,157,0,5,67,79,76,49,5
    8,1057
8A  2820 DATA32,32,32,32,157,157
    ,157,0,5,67,79,76,50,58,32,3
    2,998
A4  2830 DATA32,32,157,157,157,0
    ,5,67,79,76,51,58,32,32,32,3
    2,999
3F  2840 DATA157,157,157,0,146,5
    ,67,85,82,83,58,32,32,32,32,
    157,1282
E4  2850 DATA157,157,0,162,2,142
    ,142,3,162,19,160,0,24,32,24
    0,255,1657
F1  2860 DATA169,96,160,24,32,30
    ,171,169,0,174,142,3,32,205,
    189,32,1628
73  2870 DATA228,255,240,251,201
    ,13,240,21,238,142,3,173,142
    ,3,201,60,2411
D9  2880 DATA176,3,76,224,25,169
    ,2,141,142,3,76,219,25,32,69
    ,18,1400
C4  2890 DATA24,165,253,105,144,
    141,147,3,165,254,105,1,141,
    148,3,96,1895
02  2900 DATA0,255,0,255,0,255,0
    ,255,0,255,0,255,0,255,0,255
    ,2040
```

PROGRAM: CHARDES.LOADER

Please read 'LISTINGS' before entering program.

```
85  10 REM************************

C0  20 REM*  ANIMATION SYSTEM   *

31  30 REM* CHARACTER DESIGNER *

72  40 REM*        AEW  1968      *

AD  50 REM************************
7B  2000 FORL=0TO134:CX=0:FORD=0
    TO15:READA:CX=CX+A:POKE6704+
    L*16+D,A:NEXTD
82  2010 READA:IFA<>CXTHENPRINT"
    ERROR IN LINE";2040+(L*10):S
    TOP
0F  2020 NEXTL:END
12  2040 DATA76,61,26,0,0,0,0,0,
    0,1,1,0,0,169,147,32,513
7D  2050 DATA210,255,32,81,31,16
    9,0,141,32,208,141,33,208,16
    0,0,152,1853
79  2060 DATA153,0,4,173,134,2,1
    53,0,216,200,208,243,32,113,
    32,32,1695
74  2070 DATA165,32,32,220,32,32
    ,71,33,32,10,34,32,19,33,169
    ,0,946
6C  2080 DATA141,51,26,32,143,30
    ,169,0,141,53,26,141,54,26,3
    2,227,1292
1B  2090 DATA30,32,228,255,208,9
    ,32,28,31,32,28,31,76,129,26
    ,201,1376
B3  2100 DATA3,208,3,76,230,29,2
    01,29,208,13,173,53,26,201,7
    ,240,1700
CC  2110 DATA221,238,53,26,76,12
    6,26,201,157,208,13,173,53,2
    6,201,0,1798
FB  2120 DATA240,204,206,53,26,7
    6,126,26,201,17,208,13,173,5
    4,26,201,1850
A2  2130 DATA7,240,187,238,54,26
    ,76,126,26,201,145,208,13,17
    3,54,26,1800
1A  2140 DATA201,0,240,170,206,5
    4,26,76,126,26,201,19,208,11
    ,169,0,1733
A8  2150 DATA141,53,26,141,54,26
    ,76,126,26,201,147,208,19,32
    ,231,29,1536
0A  2160 DATA160,0,152,145,251,2
    00,192,8,208,249,32,143,30,7
    6,126,26,1998
6D  2170 DATA201,82,208,22,32,23
    1,29,160,0,177,251,73,255,14
    5,251,200,2317
55  2180 DATA192,8,208,245,32,14
    3,30,76,126,26,201,49,208,28
    ,238,134,1944
91  2190 DATA2,173,134,2,41,15,1
    41,134,2,160,0,153,0,216,200
    ,208,1581
83  2200 DATA250,32,113,32,32,10
    ,34,76,126,26,201,50,208,17,
    238,34,1479
3A  2210 DATA208,173,34,208,41,1
    5,141,34,208,32,165,32,76,12
    6,26,201,1720
AF  2220 DATA51,208,17,238,35,20
    8,173,35,208,41,15,141,35,20
    8,32,220,1865
E3  2230 DATA32,76,126,26,201,42
    ,208,22,169,81,160,0,145,180
    ,32,185,1685
4F  2240 DATA30,173,53,26,201,7,
    240,3,238,53,26,76,126,26,20
    1,32,1511
DB  2250 DATA208,22,169,32,160,0
    ,145,180,32,185,30,173,53,26
    ,201,7,1623
0C  2260 DATA240,3,238,53,26,76,
    126,26,201,43,208,12,238,51,
    26,32,1599
D2  2270 DATA143,30,32,19,33,76,
    126,26,201,45,208,12,206,51,
    26,32,1266
63  2280 DATA143,30,32,19,33,76,
    126,26,201,77,208,19,173,22,
    208,9,1402
1B  2290 DATA16,141,22,208,169,1
    ,141,55,26,32,71,33,76,126,2
    6,201,1344
E5  2300 DATA78,208,19,173,22,20
    8,41,239,141,22,208,169,0,14
    1,55,26,1750
34  2310 DATA32,71,33,76,126,26,
    201,13,208,18,169,0,141,53,2
    6,173,1366
FF  2320 DATA54,26,201,7,240,3,2
    38,54,26,76,126,26,201,90,20
    8,22,1598
A3  2330 DATA169,81,160,0,145,18
    0,32,185,30,173,54,26,201,7,
    240,3,1686
04  2340 DATA238,54,26,76,126,26
    ,201,26,208,22,169,32,160,0,
    145,180,1689
E8  2350 DATA32,185,30,173,54,26
    ,201,7,240,3,238,54,26,76,12
    6,26,1497
BB  2360 DATA201,19,208,11,169,0
    ,141,54,26,141,53,26,76,126,
    26,201,1478
D9  2370 DATA18,208,16,169,128,1
    41,138,2,169,1,141,136,3,32,
    71,33,1406
40  2380 DATA76,126,26,201,15,20
    8,16,169,0,141,138,2,169,0,1
    41,136,1564
03  2390 DATA3,32,71,33,76,126,2
    6,201,14,208,9,32,4,30,32,14
    3,1040
36  2400 DATA30,76,126,26,201,13
    3,208,26,32,231,29,160,0,24,
    177,251,1730
AD  2410 DATA42,144,2,9,1,145,25
    1,200,192,8,144,241,32,143,3
    0,76,1660
BB  2420 DATA126,26,201,134,208,
    37,32,231,29,160,0,162,0,177
    ,251,141,1915
30  2430 DATA59,26,200,177,251,1
    36,145,251,200,232,224,7,208
    ,244,173,59,2592
74  2440 DATA26,160,7,145,251,32
    ,143,30,76,126,26,201,95,208
    ,36,32,1594
F1  2450 DATA231,29,160,0,177,25
    1,141,60,3,162,0,14,60,3,110
    ,61,1462
E2  2460 DATA3,232,224,8,208,245
    ,173,61,3,145,251,200,192,8,
    208,228,2389
D6  2470 DATA32,143,30,201,71,20
    8,12,32,200,33,141,51,26,32,
    143,30,1385
A5  2480 DATA32,19,33,201,89,208
    ,21,238,58,26,173,58,26,201,
    7,208,1598
17  2490 DATA5,169,6,141,58,26,3
    2,97,34,32,10,34,201,88,208,
    21,1162
96  2500 DATA238,57,26,173,57,26
    ,201,7,208,5,169,6,141,57,26
    ,32,1429
09  2510 DATA97,34,32,10,34,201,
    25,208,21,206,58,26,173,58,2
    6,201,1410
```

```
EB  2520 DATA0,208,5,169,1,141,5
    8,26,32,97,34,32,10,34,201,2
    4,1072
EC  2530 DATA208,21,206,57,26,17
    3,57,26,201,0,208,5,169,1,14
    1,57,1556
43  2540 DATA26,32,97,34,32,10,3
    4,201,87,208,6,32,97,34,32,1
    0,972
B5  2550 DATA34,201,67,208,51,32
    ,231,29,32,200,33,141,52,26,
    169,0,1506
24  2560 DATA133,171,173,52,26,1
    33,170,6,170,38,171,6,170,38
    ,171,6,1634
78  2570 DATA170,38,171,24,165,1
    71,105,48,133,171,160,0,177,
    170,145,251,2099
C7  2580 DATA200,192,8,208,247,3
    2,143,30,201,83,208,70,32,23
    1,29,160,2074
8A  2590 DATA0,177,251,153,60,3,
    200,192,8,208,246,162,0,142,
    232,3,2037
F6  2600 DATA162,0,142,60,26,174
    ,232,3,30,60,3,174,60,26,126
    ,68,1346
5B  2610 DATA3,232,142,60,26,224
    ,8,208,236,238,232,3,173,232
    ,3,201,2221
9A  2620 DATA8,208,221,160,0,185
    ,68,3,145,251,200,192,8,208,
    246,32,2135
0A  2630 DATA143,30,234,76,126,2
    6,96,169,0,133,252,173,51,26
    ,133,251,1919
B4  2640 DATA6,251,38,252,6,251,
    38,252,6,251,38,252,24,165,2
    52,105,2187
1B  2650 DATA48,133,252,96,169,0
    ,133,170,133,168,169,208,133
    ,171,169,48,2200
9D  2660 DATA133,169,173,14,220,
    41,254,141,14,220,165,1,41,2
    51,133,1,1971
EC  2670 DATA160,0,177,170,145,1
    68,24,165,170,105,1,133,170,
    165,171,105,2029
FA  2680 DATA0,133,171,24,165,16
    8,105,1,133,168,165,169,105,
    0,133,169,1809
5D  2690 DATA165,170,208,222,165
    ,171,201,216,208,216,165,1,9
    ,4,133,1,2255
6B  2700 DATA173,14,220,9,1,141,
    14,220,173,24,208,41,240,9,1
    2,141,1640
FA  2710 DATA24,208,96,160,0,140
    ,232,3,24,177,180,201,81,208
    ,1,56,1791
3E  2720 DATA46,232,3,200,192,8,
    208,240,96,160,0,46,232,3,14
    4,5,1815
EC  2730 DATA169,81,76,135,30,16
    9,32,145,180,200,192,8,208,2
    37,96,32,1990
84  2740 DATA231,29,169,160,133,
    180,169,5,133,181,162,0,138,
    168,177,251,2286
9F  2750 DATA141,232,3,32,121,30
    ,24,165,180,105,40,133,180,1
    65,181,105,1837
55  2760 DATA0,133,181,232,224,8
    ,208,228,96,32,231,29,169,16
    0,133,180,2244
9D  2770 DATA169,5,133,181,162,0
    ,32,99,30,138,168,173,232,3,
    145,251,1921
D3  2780 DATA24,165,180,105,40,1
    33,180,165,181,105,0,133,181
    ,232,224,8,2056
5F  2790 DATA208,228,96,169,0,13
    3,180,133,181,172,54,26,192,
    0,240,16,2028
19  2800 DATA24,165,180,105,40,1
    33,180,165,181,105,0,133,181
    ,136,208,240,2176
```

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0A  2810 DATA24,165,180,109,53,2
    6,133,180,165,181,105,0,133,
    181,24,165,1824
AC  2820 DATA180,105,160,133,180
    ,165,181,105,5,133,181,96,16
    0,0,177,180,2141
F4  2830 DATA141,59,26,44,59,26,
    16,9,177,180,41,127,145,180,
    76,55,1361
DD  2840 DATA31,177,180,9,128,14
    5,180,32,70,31,172,51,26,185
    ,0,4,1421
60  2850 DATA73,128,153,0,4,96,1
    60,150,162,80,202,208,253,13
    6,208,248,2261
37  2860 DATA96,160,0,169,1,153,
    24,217,153,8,218,153,248,218
    ,200,192,2210
2F  2870 DATA240,208,242,162,8,1
    60,27,24,32,240,255,169,174,
    160,31,32,2164
19  2880 DATA30,171,162,21,160,0
    ,24,32,240,255,169,189,160,3
    1,32,30,1706
F7  2890 DATA171,169,9,141,59,26
    ,160,15,174,59,26,24,32,240,
    255,169,1729
E7  2900 DATA161,160,31,32,30,17
    1,238,59,26,173,59,26,201,19
    ,208,230,1824
56  2910 DATA96,159,166,166,166,
    166,166,166,166,166,166,166,
    5,0,159,66,2145
92  2920 DATA73,84,83,32,67,79,7
    6,79,85,82,5,0,96,158,192,19
    2,1383
6A  2930 DATA192,192,192,192,192
    ,192,192,192,192,192,192,192
    ,192,192,192,192,3072
EC  2940 DATA192,192,192,192,192
    ,192,192,192,192,192,192,192
    ,192,192,192,192,3072
A0  2950 DATA192,192,192,192,192
    ,192,77,32,32,78,32,32,43,32
    ,32,45,1587
BB  2960 DATA32,32,82,32,32,42,3
    2,32,83,80,65,67,69,32,32,67
    ,811
79  2970 DATA84,82,76,45,82,32,3
    2,67,84,82,76,45,79,32,67,84
    ,1049
CB  2980 DATA82,76,45,78,32,32,7
    0,49,32,32,70,51,32,32,32,67
    ,812
72  2990 DATA32,32,32,90,32,32,3
    2,67,84,82,76,45,90,32,32,83
    ,873
B1  3000 DATA32,32,49,32,32,50,5
    1,32,32,71,32,32,88,32,32,89
    ,718
BD  3010 DATA32,32,87,32,32,67,8
    4,82,76,45,88,32,32,67,84,82
    ,954
42  3020 DATA76,45,89,13,32,32,3
    2,32,32,32,32,32,32,32,32,32
    ,607
71  3030 DATA32,32,28,32,32,82,4
    7,83,32,84,79,32,69,88,73,84
    ,909
AE  3040 DATA0,162,10,160,27,24,
    32.240.255.173,134,2,141,59,
    26,169,1614
E9  3050 DATA149,160,32,32,30,17
    1,174,59,26,169,0,32,205,189
    ,173,59,1660
3A  3060 DATA26,141,134,2,96,5,3
    2,209,209,32,32,32,32,32,32,
    32,1078
44  3070 DATA32,157,157,157,0,16
    2,11,160,27,24,32,240,255,17
    3,134,2,1723
9D  3080 DATA141,59,26,169,204,1
    60,32,32,30,171,173,34,208,4
    1,15,170,1665
29  3090 DATA169,0,32,205,189,17
    3,59,26,141,134,2,96,5,32,32
    ,209,1504
```

```
25  3100 DATA32,32,32,32,32,32,3
    2,32,157,157,157,0,162,12,16
    0,27,1088
0B  3110 DATA24,32,240,255,173,1
    34,2,141,59,26,169,3,160,33,
    32,30,1513
09  3120 DATA171,173,35,208,41,1
    5,170,169,0,32,205,189,173,5
    9,26,141,1807
77  3130 DATA134,2,96,5,32,209,3
    2,32,32,32,32,32,32,32,32,15
    7,923
0A  3140 DATA157,157,0,162,10,16
    0,0,24,32,240,255,173,134,2,
    72,169,1747
BC  3150 DATA51,160,33,32,30,171
    ,169,0,174,51,26,32,205,189,
    104,141,1568
67  3160 DATA134,2,96,158,67,72,
    65,82,65,67,84,69,82,32,32,3
    2,1139
8D  3170 DATA32,32,157,157,157,1
    57,0,162,14,160,0,24,32,240,
    255,173,1752
63  3180 DATA134,2,141,59,26,173
    ,55,26,240,10,169,144,160,33
    ,32,30,1434
02  3190 DATA171,76,107,33,169,1
    59,160,33,32,30,171,162,15,1
    60,0,24,1502
F5  3200 DATA32,240,255,173,136,
    3,240,10,169,174,160,33,32,3
    0,171,76,1934
57  3210 DATA137,33,169,187,160,
    33,32,30,171,173,59,26,141,1
    34,2,96,1583
CD  3220 DATA30,77,85,76,84,73,3
    2,67,79,76,79,85,82,32,0,159
    ,1116
3C  3230 DATA78,79,82,77,65,76,3
    2,67,72,65,82,83,32,0,30,75,
    995
2A  3240 DATA69,89,83,32,82,69,8
    0,69,65,84,0,159,75,69,89,83
    ,1197
0E  3250 DATA32,78,79,82,77,65,7
    6,0,32,228,255,240,251,201,1
    8,208,1922
F1  3260 DATA8,169,1,141,56,26,7
    6,200,33,201,64,176,5,162,0,
    76,1394
E8  3270 DATA246,33,201,96,176,5
    ,162,64,76,246,33,201,192,17
    6,5,162,2074
BD  3280 DATA64,76,246,33,162,12
    8,142,59,26,56,237,59,26,172
    ,56,26,1568
A9  3290 DATA240,7,9,128,162,0,1
    42,56,26,96,173,58,26,141,59
    ,26,1349
74  3300 DATA173,51,26,141,52,26
    ,169,75,133,170,169,6,133,17
    1,169,75,1739
D4  3310 DATA133,168,169,218,133
    ,169,160,0,174,57,26,173,52,
    26,145,170,1973
1B  3320 DATA173,134,2,145,168,2
    38,52,26,202,200,224,0,208,2
    37,24,165,2198
B1  3330 DATA170,105,40,133,170,
    165,171,105,0,133,171,24,165
    ,168,105,40,1865
72  3340 DATA133,168,165,169,105
    ,0,133,169,206,59,26,173,59,
    26,208,198,1997
19  3350 DATA96,169,6,141,59,26,
    169,75,133,170,169,6,133,171
    ,160,0,1683
96  3360 DATA162,6,169,32,145,17
    0,202,200,224,0,208,246,24,1
    65,170,105,2228
47  3370 DATA40,133,170,165,171,
    105,0,133,171,206,59,26,173,
    59,26,208,1845
2B  3380 DATA221,96,32,35,179,67
    ,51,0,119,104,210,75,76,68,8
    9,32,1454
```

Fresh Chips

With the Printer IV chip you can improve the quality of the copy you get from your MPS 801 printer.

By Paul Eves

One of the biggest drawbacks of the MPS 801 printer is the lack of true descenders. There have been many programs written to overcome this problem. There have also been many top quality programs written which provide the user with the option of many different font styles. (*Font Master* is just one which springs to mind). All these programs have one thing in common. As software, the user has first to go through the process of loading in the program, then selecting a given font from a menu before getting on with the job in hand.

Printer IV on the other hand has none of these drawbacks, as hardware, once the chip has been installed you just flip a switch and turn it on. The selected font is now ready to go.

Fitting the chip is simplicity itself. It only took me three minutes and I am hopeless with electronics. Instructions for fitting *Printer IV* are as follows:

1. Disconnect the printer from the mains, remove the perspex cover, paper shelf, and feed knob.
2. Using a cross head screwdriver, remove the four screws holding the upper housing and the lower housing together. Lift the top away to expose the tray holding the electronics. Lift and remove the tray to the rear of the printer. Using a flathead screwdriver, carefully lift out the original character ROM chip (this is a 24 pin chip).

N.B. Take careful note of the position of the chip e.g. a small notch at one end.

3. Take the *Printer IV* character chip together with adaptor, and fit this into the carrier that housed the original chip (taking note of the position of the notch in the chip which should in mosdt cases be facing the right of the printer looking from the front). The fly lead with the two logic switches can be placed to suit (I have drilled a small hole in the rear of the housing, threaded it through and it is now permanently secure).
4. Re-assemble the printer and you are ready to use your new character sets.

CAUTION: Opening the printer will invalidate your warranty if it is still in force at the time.

There are four character sets available to you:

1. Descenders
2. Scribe
3. Eclipse
4. Futuristic

When using a word processor, it is advisable to use a pause command before switching between character sets.

It is inadvisable to switch between sets while the printer is actually printing. This will cause corrupted characters and will also result in a blown fuse inside the printer.

I would also advise that you put the original ROM chip safely away somewhere.

For anyone who uses their printer often this chip is a must. It's quick and easy to use and the end results are impressive. YC

PRINTER IV ROM CHIP

```
10 ******************************
12 *  EXAMPLE OF NORMAL TYPE   *
14 ******************************
16 :
18 :
20 POKE53280,11:POKE53281,11
22 PRINT"[CLS][YEL]ROM CHIP IV"
24 FORA=49152TO49167:READK
26 POKEA,K:CK=CK+K:NEXT
28 IFCK<>1579THENPRINT"NO":END
30 SYS49152
32 DATA20,45,134,145,125,153,134
34 DATA32,87,198,42,225,215,1,23
36 :
38 :
39 :
40 :
```

```
10 ******************************
12 *  EXAMPLE OF ECLIPSE TYPE *
14 ******************************
16 :
18 :
20 POKE53280,11:POKE53281,11
22 PRINT"[CLS][YEL]ROM CHIP IV"
24 FORA=49152TO49167:READK
26 POKEA,K:CK=CK+K:NEXT
28 IFCK<>1579THENPRINT"NO":END
30 SYS49152
32 DATA20,45,134,145,125,153,134
34 DATA32,87,198,42,225,215,1,23
36 :
38 :
39 :
40 :
```

```
10 ******************************
12 *  EXAMPLE OF ITALIC TYPE   *
14 ******************************
16 :
18 :
20 POKE53280,11:POKE53281,11
22 PRINT"[CLS][YEL]ROM CHIP IV"
24 FORA=49152TO49167:READK
26 POKEA,K:CK=CK+K:NEXT
28 IFCK<>1579THENPRINT"NO":END
30 SYS49152
32 DATA20,45,134,145,125,153,134
34 DATA32,87,198,42,225,215,1,23
36 :
38 :
39 :
40 :
```

```
10 ******************************
12 *EXAMPLE OF FUTURISTIC TYPE*
14 ******************************
16 :
18 :
20 POKE53280,11:POKE53281,11
22 PRINT"[CLS][YEL]ROM CHIP IV"
24 FORA=49152TO49167:READK
26 POKEA,K:CK=CK+K:NEXT
28 IFCK<>1579THENPRINT"NO":END
30 SYS49152
32 DATA20,45,134,145,125,153,134
34 DATA32,87,198,42,225,215,1,23
36 :
38 :
39 :
40 :
```

Plus/4 Dumper

Now you can transfer what's on your screen to paper via your printer and obtain a hard copy of everything you do.

By Mick Healey

Many larger industrial computers offer a screen-dump facility. This means that whatever is printed on the screen can be reproduced exactly on paper. Permanent copies may be obtained of just about anything you like including: Pie charts, histograms, circuit diagrams, mechanical diagrams, partial stock lists, program modifications etc.

There are programs around for text dumps, but most seem to be written in Basic and need to ask the user questions (like upper or lower case text) before they will do a printout.

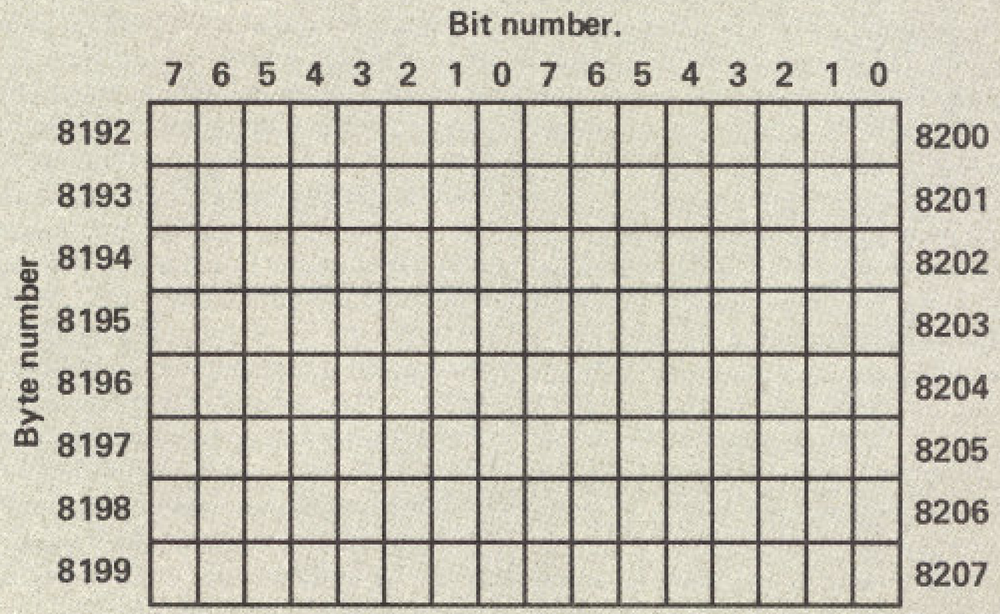
Enter then, the all singing, all dancing, intelligent screen dump program. This program will check automatically whether upper or lower case text is being displayed and print accordingly. Reversed characters are also recognised and dealt with by this program (automatically). There is, of course, one BUT. . .but it cannot print the double quotes symbol. This is due to an inherent function of the MPS-801 printer. When the printer prints an odd number of double quotes, it starts to print ASCII tokens for the printer control codes used by this program. The result is a totally disorganised mess, which does not look much like the original. For this reason the double quotes symbol will be replaced by a single quote every time it appears. This is unfortunate but is the same method used by the word processor package in the Plus/4 itself.

While I am on the bad points, I should also mention that custom characters cannot be dumped from the text screen, though they can from the graphics screen. Also, when obtaining a graphics dump the last three rows of pixels on the screen will not be dumped, though this is usually unimportant.

Great care has been taken to make this program 'invisible' to Basic and its variables. Once loaded this program can be considered as one of the computer's functions. It lives and works between locations $4000 and $467E. Some of the routines used need to change values stored in page zero. This would then upset important vectors stored in page zero and cause the computer to crash. For this reason the program will store page zero (in its entirety) in a safe place, before any damage is done. Page zero is then returned at the end of the program. The end result of this is that the computer has been made to produce a printout, and will continue to do what it was doing before, as if nothing had happened (i.e.: this program is invisible).

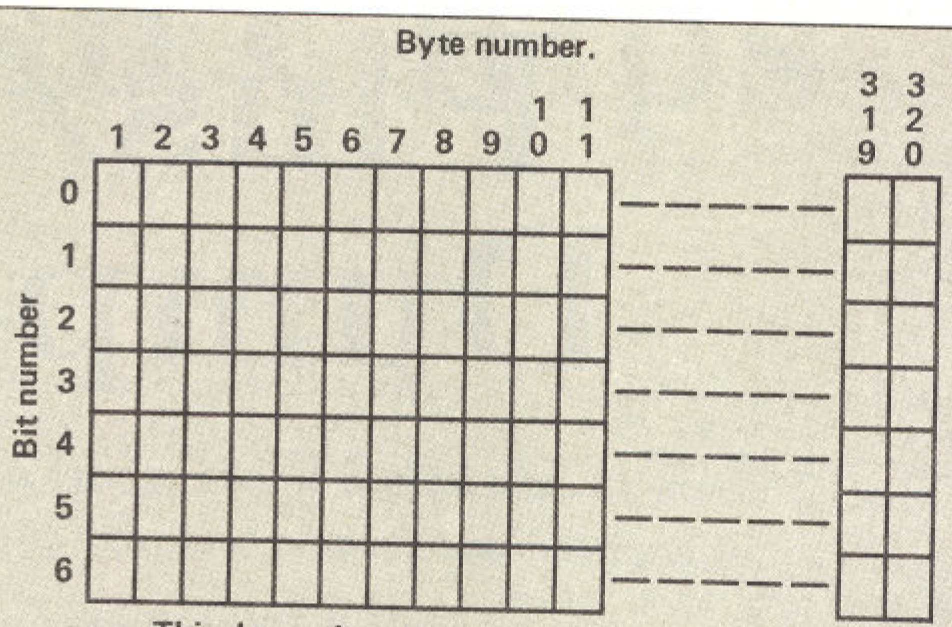
The function keys have also been re-assigned. This allows the text/graphics dump to be used in direct mode as well as program mode. Pressing function key F1 will cause a text dump to be produced. Function key F4 gives a graphics dump. To include these routines in a basic program then call the following:

SYS 16384 for a text dump.
SYS 16645 for a graphics dump.



This shows the pattern of bytes and bits as they appear on the screen. (Two character spaces in top left of screen represented.)

Figure 1.



This shows the pattern of bytes and bits as they appear on the printer. (First row represented.)

Figure 2.

Memory Allocation

The following addresses are all in hexadecimal, the descriptions explain what happens in that area of memory.

055F – 059F – function keys (re-assigned).
4000 – 4104 – text dump program.
4105 – 4283 – graphic dump program.
4284 – 4290 – save page zero in safe area routine.
4291 – 429D – return safe area to page zero routine.
429E – 442D – graphic screen address table.
442E – 4434 – unprocessed graphic character.
4435 – 443C – processed graphic character.
443D – 457E – output buffer (graphics & text).
457F – 467E – safe area for temp store of page zero.

Text Dump

The text dump is basically a code converter. Firstly, all of page zero is stored in a safe area at $457F by the routine at $4284. This will protect all vectors set up by a Basic program. The contents of location $FF13 are then checked to see if the screen in displaying upper or lower case text. A channel is then opened to the printer. The appropriate font will be selected according to the contents of $FF13 (ref: pages 40-41 of the MPS-801 Users/Manual). Locations $22 and $23 are loaded with the start address of the text screen ($0C00). The X-register (row counter) and the Y-register (column counter on screen) are both set to zero. Location $4B is a counter which keeps track of how many characters are to be sent to the printer to produce a row of print. The value stored in $4B will vary depending on how many reversed characters are to be sent. Every time a reversed character is to be printed, three characters have to be sent: RVS ON, the character, RVS OFF. Location $4B is set to zero for each row being processed, as is the Y-register.

A problem exists with the text dump, which is the reason for the length of the text dump program. The characters stored in text screen memory are stored as screen display code. Characters to be sent to the printer must be sent as ASCII code (ref: pages 192-196 of the Plus/4 User Manual). As can be seen from the two tables in the User Manual, each character has two different values. Conveniently the characters have been grouped into sets of 32. It is the order of the sets that is different. The program takes a character from the text screen memory, and finds out which set of 32 it is in (screen display code).

From this point it is merely a case of adding a pre-defined number to do the conversion. The method used to find which set a character is in, is purely a case of subtraction. The character value is taken, #$20 subtracted and accumulator is checked, to see if it contains a positive number. If it does contain a positive number then the character must belong to a higher group of 32 characters. In this case the #$20 is added back to the number and the analysis is continued in the same way by substracting # $40, # $60 and #$80 in that order. Each time, if the answer is positive, the number subtracted is replaced. When the result in the accumulator is not positive then the program has located which block of 32 the character belongs to. The program will then add # $60, # $40, #$C0 depending whether the character is in the first, second, third or fourth set of 32 characters respectively.

Example

Assume the character to be processed is the spade symbol. As can be seen in the SDC table it has a screen display code of 65 (decimal) which is $41 in hex. To convert to ASCII the program follows this method:

#$41 screen display code for spade symbol
#$21 substract #$20
ANSWER IS POSITIVE SO NOT IN THIS GROUP OF 32.
#$41 replace #$20
#$01 substract #$40
ANSWER IS POSITIVE SO NOT IN THIS GROUP OF 32.
#$41 replace #$40
#$E1 substract #$60
NOTE: THE NUMBER HAS WRAPPED AROUND THE NEGATIVE FLAG IN THE PROCESSOR HAS BEEN SET, THIS IS THE CORRECT GROUP OF 32 CHARACTERS.
#$61 add pre-defined number #$80.
THIS IS THE ANSWER !!! #$61 IS 97 IN DECIMAL. CHR$(97) IS THE SPADE SYMBOL.

However, just before the above process is executed, the screen display code currently being processed is ANDed with #$80. If the result is less than, or equal to, #$7F then the above process is executed in the normal way. If however the result is greater than #$80 then the program realises it is dealing with a reversed character, so it stores #$12 in the next free location in the output buffer ($443D plus the contents of $4B). This sets the printer up for RVS ON. The value in $4B is incremented by #$01. The character is then converted in the normal way and

stored in the next free location in the output buffer. If the program is dealing with a reversed character then it will store #$92 in the next free location (RVS OFF) and again increment $4B by #$01.

When each character has been fully processed and stored in the output buffer (including RVS ON and RVS OFF codes) the Y-register is incremented by #$01. When the Y-register reaches #$28 one row of text has been processed and is stored in the output buffer. The routine at $40AF then sends the processed data to the printer, followed by a carriage return. The X-register is incremented by #$01 and compared with #$19. If it is less than #$19 then the text screen row location (stored in #$22 #$23) is incremented by #$28 and the whole process repeated for the next row.

When all rows have been printed the printer is set to the default font and the channel to the printer is closed. Page zero is restored by the routine at $4291 and the program returns to Basic as if nothing had happened.

The program works because each high resolution image on the screen is actually made up of 64,000 dots (each individually selectable) arranged in a definite (though rather complex) pattern. In much the same way the printer produces its images using a pattern of dots, although the way the dots are organised is very different.

In essence then, this program must translate the pattern of dots on the screen, to a pattern recognisable by the printer, while preserving the image to be printed.

Because there are 64,000 dots some or all of which have to be translated and sent to the printer, it can be seen that a great deal of processing has to be done. The programmer/user will want their printout as quickly as possible (in business this would be essential – time is money), so the whole routine has been written in machine code. This gives a considerable time saving over the equivalent Basic program which took 25 minutes to produce a single high-res screen dump. In machine code this process is reduced to three minutes. This is still fairly slow – but is the maximum speed obtainable using the MPS-801 printer. The reason for this is the size of the printers input buffer – 90 bytes. A single row of the high-res screen uses 320 bytes. In order for the printer to produce a single row of the high-res screen its buffer must be filled and emptied four times. This involves reading 90 bytes of translated data from the computer – telling the computer not to send any more data – printing the 90 bytes now in the input buffer – request the next 90 bytes and so on. In other words the printer head must make four passes for each row of high-res screen.

Budding electronic enthusiasts may find a way to make the input buffer larger and so reduce the printing time, the rest of us will have to wait two minutes.

MONITOR: FUNKEY

```
  PC  SR AC XR YR SP
 FFFF 00 FF FF FF F8

>055F 09 06 0A 09 07 06 04 05
>0567 53 59 53 31 36 33 38 34
>056F 0D 44 4C 4F 41 44 22 44
>0577 49 52 45 43 54 4F 52 59
>057F 0D 53 59 53 31 36 36 34
>0587 35 0D 53 43 4E 43 4C 52
>058F 0D 44 53 41 56 45 22 52
>0597 53 4E 0D 48 45 4C 50 0D
>059F 00 00 00 00 00 FF FF FF
```

MONITOR: GRATEX

```
   PC  SR AC XR YR SP
 ; FFFF 00 FF FF FF F8

 . 4000  20 84 42 JSR $4284
 . 4003  AD 13 FF LDA $FF13
 . 4006  C9 D1    CMP #$D1
 . 4008  D0 05    BNE $400F
 . 400A  A0 08    LDY #$08
 . 400C  4C 11 40 JMP $4011
 . 400F  A0 07    LDY #$07
 . 4011  A2 04    LDX #$04
 . 4013  A9 04    LDA #$04
 . 4015  20 BA FF JSR $FFBA
 . 4018  A9 00    LDA #$00
 . 401A  20 BD FF JSR $FFBD
 . 401D  20 C0 FF JSR $FFC0
 . 4020  A2 04    LDX #$04
 . 4022  20 C9 FF JSR $FFC9
 . 4025  A9 00    LDA #$00
 . 4027  85 22    STA $22
 . 4029  A9 0C    LDA #$0C
 . 402B  85 23    STA $23
 . 402D  A2 00    LDX #$00
 . 402F  A0 00    LDY #$00
 . 4031  98       TYA
 . 4032  85 4B    STA $4B
 . 4034  38       SEC
 . 4035  B1 22    LDA ($22),Y
 . 4037  85 5E    STA $5E
 . 4039  29 7F    AND #$7F
 . 403B  C9 22    CMP #$22
 . 403D  D0 07    BNE $4046
 . 403F  18       CLC
 . 4040  A5 5E    LDA $5E
 . 4042  69 05    ADC #$05
 . 4044  85 5E    STA $5E
 . 4046  A5 5E    LDA $5E
 . 4048  85 5D    STA $5D
 . 404A  38       SEC
 . 404B  98       TYA
 . 404C  48       PHA
 . 404D  A5 4B    LDA $4B
 . 404F  A8       TAY
 . 4050  A5 5E    LDA $5E
 . 4052  29 80    AND #$80
 . 4054  F0 09    BEQ $405F
 . 4056  20 E2 40 JSR $40E2
 . 4059  A5 5E    LDA $5E
 . 405B  29 7F    AND #$7F
 . 405D  85 5E    STA $5E
 . 405F  A5 5E    LDA $5E
 . 4061  E9 20    SBC #$20
 . 4063  18       CLC
 . 4064  10 08    BPL $406E
 . 4066  69 60    ADC #$60
 . 4068  99 3D 44 STA $443D,Y
 . 406B  4C 9B 40 JMP $409B
 . 406E  69 20    ADC #$20
 . 4070  38       SEC
 . 4071  E9 40    SBC #$40
 . 4073  18       CLC
 . 4074  10 08    BPL $407E
 . 4076  69 40    ADC #$40
 . 4078  99 3D 44 STA $443D,Y
 . 407B  4C 9B 40 JMP $409B
 . 407E  69 40    ADC #$40
 . 4080  38       SEC
 . 4081  E9 60    SBC #$60
 . 4083  18       CLC
 . 4084  10 08    BPL $408E
 . 4086  69 80    ADC #$80
 . 4088  99 3D 44 STA $443D,Y
 . 408B  4C 9B 40 JMP $409B
 . 408E  69 60    ADC #$60
 . 4090  38       SEC
 . 4091  E9 80    SBC #$80
 . 4093  18       CLC
 . 4094  10 05    BPL $409B
 . 4096  69 C0    ADC #$C0
 . 4098  99 3D 44 STA $443D,Y
 . 409B  68       PLA
 . 409C  A8       TAY
 . 409D  C8       INY
 . 409E  E6 4B    INC $4B
 . 40A0  A5 5D    LDA $5D
 . 40A2  29 80    AND #$80
 . 40A4  F0 03    BEQ $40A9
 . 40A6  20 F4 40 JSR $40F4
 . 40A9  C0 28    CPY #$28
 . 40AB  D0 87    BNE $4034
 . 40AD  A0 00    LDY #$00
 . 40AF  B9 3D 44 LDA $443D,Y
 . 40B2  20 D2 FF JSR $FFD2
 . 40B5  C8       INY
 . 40B6  C4 4B    CPY $4B
 . 40B8  D0 F5    BNE $40AF
 . 40BA  A9 0D    LDA #$0D
 . 40BC  20 D2 FF JSR $FFD2
 . 40BF  E8       INX
 . 40C0  E0 19    CPX #$19
 . 40C2  D0 0E    BNE $40D2
 . 40C4  A9 91    LDA #$91
 . 40C6  20 D2 FF JSR $FFD2
 . 40C9  A9 04    LDA #$04
 . 40CB  20 C3 FF JSR $FFC3
 . 40CE  20 91 42 JSR $4291
 . 40D1  60       RTS
 . 40D2  18       CLC
 . 40D3  A5 22    LDA $22
 . 40D5  69 28    ADC #$28
 . 40D7  85 22    STA $22
 . 40D9  A5 23    LDA $23
```

```
. 40DB  69 00     ADC #$00
. 40DD  85 23     STA $23
. 40DF  4C 2F 40  JMP $402F
. 40E2  8A        TXA
. 40E3  85 4C     STA $4C
. 40E5  A5 4B     LDA $4B
. 40E7  AA        TAX
. 40E8  A9 12     LDA #$12
. 40EA  9D 3D 44  STA $443D,X
. 40ED  E6 4B     INC $4B
. 40EF  A5 4C     LDA $4C
. 40F1  AA        TAX
. 40F2  C8        INY
. 40F3  60        RTS
. 40F4  8A        TXA
. 40F5  85 4C     STA $4C
. 40F7  A5 4B     LDA $4B
. 40F9  AA        TAX
. 40FA  A9 92     LDA #$92
. 40FC  9D 3D 44  STA $443D,X
. 40FF  E6 4B     INC $4B
. 4101  A5 4C     LDA $4C
. 4103  AA        TAX
. 4104  60        RTS
. 4105  20 84 42  JSR $4284
. 4108  A2 04     LDX #$04
. 410A  A9 04     LDA #$04
. 410C  A0 00     LDY #$00
. 410E  20 BA FF  JSR $FFBA
. 4111  A9 00     LDA #$00
. 4113  20 BD FF  JSR $FFBD
. 4116  20 C0 FF  JSR $FFC0
. 4119  A2 04     LDX #$04
. 411B  20 C9 FF  JSR $FFC9
. 411E  A9 08     LDA #$08
. 4120  20 D2 FF  JSR $FFD2
. 4123  A9 00     LDA #$00
. 4125  85 5B     STA $5B
. 4127  85 5E     STA $5E
. 4129  A9 9E     LDA #$9E
. 412B  85 4B     STA $4B
. 412D  A9 42     LDA #$42
. 412F  85 4C     STA $4C
. 4131  A9 3D     LDA #$3D
. 4133  85 5C     STA $5C
. 4135  A9 44     LDA #$44
. 4137  85 5D     STA $5D
. 4139  A5 5E     LDA $5E
. 413B  C9 1C     CMP #$1C
. 413D  D0 03     BNE $4142
. 413F  4C 64 42  JMP $4264
. 4142  E6 5E     INC $5E
. 4144  A9 00     LDA #$00
. 4146  85 5B     STA $5B
. 4148  A0 00     LDY #$00
. 414A  A2 00     LDX #$00
. 414C  B1 4B     LDA ($4B),Y
. 414E  95 4D     STA $4D,X
. 4150  C8        INY
. 4151  E8        INX
. 4152  C0 0E     CPY #$0E
. 4154  D0 F6     BNE $414C
. 4156  18        CLC
. 4157  A5 4B     LDA $4B
. 4159  69 0E     ADC #$0E
. 415B  85 4B     STA $4B
. 415D  A5 4C     LDA $4C
. 415F  69 00     ADC #$00
. 4161  85 4C     STA $4C
. 4163  A9 00     LDA #$00
. 4165  85 5B     STA $5B
. 4167  A2 00     LDX #$00
. 4169  A9 00     LDA #$00
. 416B  9D 35 44  STA $4435,X
. 416E  E8        INX
. 416F  E0 08     CPX #$08
. 4171  D0 F6     BNE $4169
. 4173  A0 00     LDY #$00
. 4175  B1 4D     LDA ($4D),Y
. 4177  8D 2E 44  STA $442E
. 417A  B1 4F     LDA ($4F),Y
. 417C  8D 2F 44  STA $442F
. 417F  B1 51     LDA ($51),Y
. 4181  8D 30 44  STA $4430
. 4184  B1 53     LDA ($53),Y
. 4186  8D 31 44  STA $4431
. 4189  B1 55     LDA ($55),Y
. 418B  8D 32 44  STA $4432
. 418E  B1 57     LDA ($57),Y
. 4190  8D 33 44  STA $4433
. 4193  B1 59     LDA ($59),Y
. 4195  8D 34 44  STA $4434
. 4198  A9 01     LDA #$01
. 419A  85 02     STA $02
. 419C  A0 00     LDY #$00
. 419E  A2 00     LDX #$00
. 41A0  A9 00     LDA #$00
. 41A2  9D 35 44  STA $4435,X
. 41A5  E8        INX
. 41A6  E0 08     CPX #$08
. 41A8  D0 F8     BNE $41A2
. 41AA  A2 00     LDX #$00
. 41AC  18        CLC
. 41AD  B9 2E 44  LDA $442E,Y
. 41B0  2A        ROL
. 41B1  99 2E 44  STA $442E,Y
. 41B4  90 03     BCC $41B9
. 41B6  4C C1 41  JMP $41C1
. 41B9  E8        INX
. 41BA  E0 08     CPX #$08
. 41BC  D0 EF     BNE $41AD
. 41BE  4C CF 41  JMP $41CF
. 41C1  18        CLC
. 41C2  BD 35 44  LDA $4435,X
. 41C5  65 02     ADC $02
. 41C7  9D 35 44  STA $4435,X
. 41CA  E8        INX
. 41CB  E0 08     CPX #$08
. 41CD  D0 DE     BNE $41AD
. 41CF  C8        INY
. 41D0  06 02     ASL $02
. 41D2  C0 07     CPY #$07
. 41D4  D0 D4     BNE $41AA
. 41D6  A2 00     LDX #$00
. 41D8  18        CLC
. 41D9  BD 35 44  LDA $4435,X
. 41DC  69 80     ADC #$80
. 41DE  9D 35 44  STA $4435,X
. 41E1  E8        INX
. 41E2  E0 08     CPX #$08
. 41E4  D0 F2     BNE $41D8
. 41E6  A0 00     LDY #$00
. 41E8  B9 35 44  LDA $4435,Y
. 41EB  91 5C     STA ($5C),Y
. 41ED  C8        INY
. 41EE  C0 08     CPY #$08
. 41F0  D0 F6     BNE $41E8
. 41F2  18        CLC
. 41F3  A5 5C     LDA $5C
. 41F5  69 08     ADC #$08
. 41F7  85 5C     STA $5C
. 41F9  A5 5D     LDA $5D
. 41FB  69 00     ADC #$00
. 41FD  85 5D     STA $5D
. 41FF  A5 5B     LDA $5B
. 4201  C9 27     CMP #$27
. 4203  F0 03     BEQ $4208
. 4205  4C 4A 42  JMP $424A
. 4208  A9 0A     LDA #$0A
. 420A  A0 00     LDY #$00
. 420C  91 5C     STA ($5C),Y
. 420E  C8        INY
. 420F  A9 0A     LDA #$0A
. 4211  91 5C     STA ($5C),Y
. 4213  A5 5E     LDA $5E
. 4215  48        PHA
. 4216  A5 4B     LDA $4B
. 4218  48        PHA
. 4219  A5 4C     LDA $4C
. 421B  48        PHA
. 421C  A0 00     LDY #$00
. 421E  A2 04     LDX #$04
. 4220  B9 3D 44  LDA $443D,Y
. 4223  20 D2 FF  JSR $FFD2
. 4226  C8        INY
. 4227  C0 00     CPY #$00
. 4229  D0 F5     BNE $4220
. 422B  B9 3D 45  LDA $453D,Y
. 422E  20 D2 FF  JSR $FFD2
. 4231  C8        INY
. 4232  C0 41     CPY #$41
. 4234  D0 F5     BNE $422B
. 4236  68        PLA
. 4237  85 4C     STA $4C
. 4239  68        PLA
. 423A  85 4B     STA $4B
. 423C  68        PLA
. 423D  85 5E     STA $5E
. 423F  A9 3D     LDA #$3D
. 4241  85 5C     STA $5C
. 4243  A9 44     LDA #$44
. 4245  85 5D     STA $5D
. 4247  4C 39 41  JMP $4139
. 424A  E6 5B     INC $5B
. 424C  A2 00     LDX #$00
. 424E  18        CLC
. 424F  B5 4D     LDA $4D,X
. 4251  69 08     ADC #$08
. 4253  95 4D     STA $4D,X
. 4255  E8        INX
. 4256  B5 4D     LDA $4D,X
. 4258  69 00     ADC #$00
. 425A  95 4D     STA $4D,X
. 425C  E8        INX
. 425D  E0 0E     CPX #$0E
. 425F  D0 ED     BNE $424E
. 4261  4C 67 41  JMP $4167
. 4264  A2 04     LDX #$04
. 4266  A9 0D     LDA #$0D
. 4268  20 D2 FF  JSR $FFD2
. 426B  A9 0F     LDA #$0F
. 426D  20 D2 FF  JSR $FFD2
. 4270  A9 04     LDA #$04
. 4272  20 C3 FF  JSR $FFC3
. 4275  20 91 42  JSR $4291
. 4278  A9 0D     LDA #$0D
. 427A  20 D2 FF  JSR $FFD2
. 427D  20 D2 FF  JSR $FFD2
. 4280  20 D2 FF  JSR $FFD2
. 4283  60        RTS
. 4284  A2 00     LDX #$00
. 4286  B5 00     LDA $00,X
. 4288  9D 7F 45  STA $457F,X
. 428B  E8        INX
. 428C  E0 00     CPX #$00
. 428E  D0 F6     BNE $4286
. 4290  60        RTS
. 4291  A2 00     LDX #$00
. 4293  BD 7F 45  LDA $457F,X
. 4296  95 00     STA $00,X
. 4298  E8        INX
. 4299  E0 00     CPX #$00
. 429B  D0 F6     BNE $4293
. 429D  60        RTS
```

The program is stored in RAM starting at location $4105 (16645 decimal) and is protected from Basic and its variables. When the program is loaded in to memory an address table starting at location $429E (17054 decimal) is also loaded. This address table contains the start address of each row on the screen. The program takes seven of these start addresses to produce the first row of print on the printer. It should be noted that a single row on the screen is eight dots deep, the printer can only print seven dots deep and this is the main reason for the address table. The eighth address is carried forward and used as the first address in the second row.

The program uses these addresses to look at the screen and decide which dots are 'ON' and which are 'OFF'. This process is too complicated to explain in much detail without writing a book so an assembler listing has been included for the inquisitive machine code programmer.

Briefly!

The main working parts of this program are the address table, a set of eight 'dummy bytes' which store the results as they are obtained, the 'result buffer' which stores the 320 bytes to be sent to the printer. The dots on the screen are printed from left to right (within each byte) on the screen, while they are arranged from top to bottom on the printer (see Figs 1 and 2). Each byte on the screen represents eight dots accross the screen, but on the printer only seven dots down the paper. The program looks at bit 0 of each byte in turn on the screen (of which only seven chosen from the address table are being processed) to see if it is 'ON' or 'OFF'. If the bit is OFF then the program looks at the same bit in the next byte. If the bit is 'ON' then a number to the power of two is added to the appropriate 'dummy byte' (NOTE: these dummy bytes are always preset to 0 before processing a set of seven bytes). The number which is raised to the power of two is derived from whichever of the seven bytes is being worked upon i.e. if in the first of the seven bytes then add 210 to the appropriate dummy byte, if in the second then add 211, the third add 212 and so on.

The result of all this processing is eight, seven-bit numbers all less than or equal to $7f (127). To each of these numbers the program adds $80 (128). The final eight results are then stored in the 320 byte buffer located at $443D (17469).

The program then adds $08 to each of the seven addresses it took from the address table and repeats this and the above process 40 times. It has then translated the first row on the screen.

At this point the 320 bytes of data that have been processed are now ready to send to the printer, which it does. When the printer has done its bit (remember four passes of the print head) the program takes the next seven addresses from the address table and repeats the above processes 25 times, so printing all rows and hence the entire screen (well, all except the bottom three dots of the last row – which did not justify the extra programming required).

The program must now return to Basic from the same point it left. This has been achieved by saving ALL of page zero in a safe area of memory starting at $457F (17791) before any translation starts (i.e. at the beginning of the program). Page zero is then returned to its rightful place after all processing is complete (i.e. at the end of the program). When the RTS instruction at the end of the program is encountered, the program will send the processor to the point it started before a printout was requested.

The instructions below seem quite complicated at first, but are really very simple. The whole program does not have to be entered at one sitting provided what you have done so far is saved. If at any time you decide to save what you have typed, simply execute the next SAVE routine in the instructions and make a note of the address you have reached. At the next sitting you can reload the program using the name specified in the save routine. You may then carry on as if nothing had happened starting at the address noted previously. The ony thing to watch is to change the filename of that section when you need to save it again.

MONITOR: TABLE

```
   PC  SR AC XR YR SP
; F764 00 E0 FD F4 F8

>429E 00 20 01 20 02 20 03 20 :
>42A6 04 20 05 20 06 20 07 20 :
>42AE 40 21 41 21 42 21 43 21 :
>42B6 44 21 45 21 46 21 47 21 :
>42BE 80 22 81 22 82 22 83 22 :
>42C6 84 22 85 22 86 22 87 22 :
>42CE C0 23 C1 23 C2 23 C3 23 :
>42D6 C4 23 C5 23 C6 23 C7 23 :
>42DE 00 25 01 25 02 25 03 25 :
>42E6 04 25 05 25 06 25 07 25 :
>42EE 40 26 41 26 42 26 43 26 :
>42F6 44 26 45 26 46 26 47 26 :
>42FE 80 27 81 27 82 27 83 27 :
>4306 84 27 85 27 86 27 87 27 :
>430E C0 28 C1 28 C2 28 C3 28 :
>4316 C4 28 C5 28 C6 28 C7 28 :
>431E 00 2A 01 2A 02 2A 03 2A :
>4326 04 2A 05 2A 06 2A 07 2A :
>432E 40 2B 41 2B 42 2B 43 2B :
>4336 44 2B 45 2B 46 2B 47 2B :
>433E 80 2C 81 2C 82 2C 83 2C :
>4346 84 2C 85 2C 86 2C 87 2C :
>434E C0 2D C1 2D C2 2D C3 2D :
>4356 C4 2D C5 2D C6 2D C7 2D :
>435E 00 2F 01 2F 02 2F 03 2F :
>4366 04 2F 05 2F 06 2F 07 2F :
>436E 40 30 41 30 42 30 43 30 :
>4376 44 30 45 30 46 30 47 30 :
>437E 80 31 81 31 82 31 83 31 :
>4386 84 31 85 31 86 31 87 31 :
>438E C0 32 C1 32 C2 32 C3 32 :
>4396 C4 32 C5 32 C6 32 C7 32 :
>439E 00 34 01 34 02 34 03 34 :
>43A6 04 34 05 34 06 34 07 34 :
>43AE 40 35 41 35 42 35 43 35 :
>43B6 44 35 45 35 46 35 47 35 :
>43BE 80 36 81 36 82 36 83 36 :
>43C6 84 36 85 36 86 36 87 36 :
>43CE C0 37 C1 37 C2 37 C3 37 :
>43D6 C4 37 C5 37 C6 37 C7 37 :
>43DE 00 39 01 39 02 39 03 39 :
>43E6 04 39 05 39 06 39 07 39 :
>43EE 40 3A 41 3A 42 3A 43 3A :
>43F6 44 3A 45 3A 46 3A 47 3A :
>43FE 80 3B 81 3B 82 3B 83 3B :
>4406 84 3B 85 3B 86 3B 87 3B :
>440E C0 3C C1 3C C2 3C C3 3C :
>4416 C4 3C C5 3C C6 3C C7 3C :
>441E 00 3E 01 3E 02 3E 03 3E :
>4426 04 3E 05 3E 06 3E 07 3E :
```

Instructions

NOTE: Do not deviate from this sequence, it can very soon become confusing otherwise.

1) Refer to the lising 'FUNKEY'.

2) Type: MONITOR (return).

3) Type: M 055F (return).

4) Change the values that appear on the screen, by typing over them to the values in the listing 'FUNKEY'. Do not attempt to alter the reversed characters on the right of each row.

5) Type: S'FUNKEY',n,055F,059F where n=1 for tape or n=8 for disk. NOTE: The first program has been saved on tape or disk.

6) Refer to the listing 'GRATEX'.

7) Type: A 4000 JSR $4284 (return).

8) The screen will now prompt you with $4003. Type: LDA $FF13 (return).

9) Continue in this fashion until the end of the 'GRATEX' listing.

10) Type: S'GRATEX',n,4000,429E where n=1 for tape or n=8 for disk.

11) Refer to the listing 'TABLE'.

12) Type: M 429E (return)

13) Change the values on the screen to those in the listing 'TABLE' by overtyping. When the first screenful has been changed then type: M (return) to obtain the next screenful. Continue in this fashion until the end of the listing 'TABLE'.

14) Type S'TABLE',n,429E,442E where n=1 for tape or n=8 for disk.

15) Type: L'GRATEX',n (return) n=1 for tape or n=8 for disk.

16) Type: L'TABLE',n (return) n=1 for tape or n=8 for disk.

17) Type: S'SUPERDUMP',n,4000, 442E (return).
NOTE: make another backup copy on another tape or disk.

18) Type: X (return) you are now back in Basic.

19) Enter the following Basic program.

```
10 GRAPHIC1:GRAPHIC0:POKE
44,72:POKE46,72:POKE50,72
20 NEW
```

20) Type: DSAVE'NEW' (return).

NOTE: If using a disk drive then the programs 'GRATEX' and 'TABLE' may be erased from the disk since they are now combined under the heading 'SUPERDUMP'.
To do this enter the following Basic commands:

SCRATCH 'GRATEX',DO (return)
SCRATCH 'TABLE',DO (return)

If all has worked out well, you should now have three programs: 'FUNKEY', 'SUPERDUMP' and 'NEW'.

This program is very simple to use once loaded. To load the program into memory follow these instructions:

1) Switch the Plus/4 'OFF' then 'ON' again. (The best reset known).
2) Type: DLOAD'NEW' (return) (LOAD for tape) then RUN (return).
3) Type: MONITOR (return).
4) Type: L'FUNKEY',n (return) n=1 for tape or n=8 for disk.
5) Type: L'SUPERDUMP',n (return).
6) Type: X (return).

The computer is now in Basic and the Superdump program is in memory.

The superdump may be used in direct mode or program mode.

Direct Mode

Stop your program when the screen you want to print is being displayed. Press F1 for a text dump. Press F4 for a graphic dump.
That's it the Plus/4 does the rest!

Program Mode

When writing a program you may decide that a screendump option would be useful. This is very simple to achieve. Simply include the appropriate instruction (below) for your requirement.

TEXT DUMP type: SYS16384
GRAPHIC DUMP type: SYS16645

Again, the computer will do the rest.

I am sure that this program will be of very great interest to many people. This program took me six months to perfect (spare evenings) and to me at least, was worth every minute. YC

Fault Finding

Entering a program into your computer only to find that it doesn't work is extremely frustrating. Here are a few tips on some of the most common problems.

By Stuart Cooke

Whether you are entering a program from a book or magazine or you are trying to create your own masterpiece those little bugs always manage to slip their way into your code somewhere.

So what do you do? Well, the first and most obvious method of de-bugging a program is to sit down and read it through. Even this isn't infallible, and so I speak from experience, you check it, your neighbour checks it, Freddie the family parrot even gets in one the job. But still the error hides in their somewhere.

Having dealt with people's programming queries for a number of years I have noticed a several specific programming errors keep rearing their heads again and again. I hope this article will provide some tips that will help you to de-bug your programs more easily.

Know it All?

Some people think that the computer is a device that is totally infallible, this isn't the case. Probably the most common problem is the fact that the computer gives you an error in a certain line number. You go to the line, check it, check it again and even get someone else to check it. Don't be fooled, just because the computer says that the error is in line X, DON'T BELIEVE IT. Your problem may be elsewhere. I shall prove this point in an example later in this article.

All Blank

Quite often people will write or type in a program, RUN it and then find they simply get a blank screen. One of the most common mistakes here is that you may not realise that the computer may be giving you an error report, it's just that you can't see it. A small example will illustrate just what I mean. Type the following into your computer:

```
10 POKE 53280,0:POKE 53281,0
20 PRINT "[BLACK] HELLO WORLD"
```

Line 10 should be replaced with the following if using a C16, Plus/4 or C128.

```
10 COLOR 0,1:COLOR 4,1
```

Don't forget items in square brackets are mnemonics for Commodore control codes. Read *Listings* if you are not sure about this. [BLACK] means press the CONTROL &1 keys at the same time.

RUN this program and see what happens. The program works OK, you simply can't see the message that is printed since it is printed on a black background with black text. Line 10 simply sets the border and screen to black.

Now this program works without any problems, but what would happen if there was an error in there? Let's add a line to the above example:

```
30 THIS WILL CREATE AN ERROR
```

As you are no doubt aware this line will cause a SYNTAX ERROR when the program is RUN. Let's RUN it and see. What happened? Nothing seemed to happen, your screen is still black. The error message will be printed out, you simply can't see it as it is in black on a black background. If we change the colour of the text in line 20 then all should become apparent. Change line 20 to:

```
20 PRINT "[WHITE] HELLO WORLD"
```

Remember what I said about square brackets.

Now RUN the program and you will see the SYNTAX error message appear.

You mayu think that this is an extremely simple error and that everyone should spot it. It may be simple but is overlooked surprisingly often.

C128 owners have a further problem, the FAST command. For those of you not used to this command it simply turns off the display of the C128 which means that the computers speed will increase. You can still print to the screen, but you can't see what you put on it. So what would happen if the computer came across an error? You would get the same effect as above. The error message will be printed to the screen you just won't be able to see it. As a general rule of thumb, when entering a C128 program omit all FAST statements until you are sure that the program is working correctly. Then put the FAST statement back in.

If you own a C128 then you could try the following program to demonstrate this:

```
10 FAST
20 PRINT "HI THERE !"
30 I'M GOING TO CAUSE AN ERROR
```

Now RUN the program. The program will print out the message in line 20 and line 30 will generate an error message, you simply can't see it.

Enter the following command on the keyboard. You won't be able to see it so type carefully:

```
SLOW
```

Your screen will now come back on and you will see both the 'HI THERE!' and the error message.

So if your screen is blank and nothing is happening what should you do?

On a C128 you could first try typing SLOW just in case the computer has been put into fast mode. On other computers, and the C128 if the above fails, try changing the ink colour to see if the cursor re-appears, CONTROL and a number will do this. If the cursor does re-appear then you know that your program has finished and printed some sort of message on the screen. Find out where the colour of the ink is changed to that of the background within the program, change it to something else and re-run the program. You will now see the message when the program stops.

Illegal What?

Quite often programs will be published that contain a lot of DATA statements. Somewhere within the program this DATA will be READ and the value then POKEd into memory. *Your Commodore* uses this type of program quite a lot as a way of getting machine code into memory. One of the most common problems that people get with these is that, when the program is RUN, the computer responds with an ILLEGAL QUANTITY ERROR in a certain line. If you enter the following example I will show you, as I promised, that the computer is not always right:

```
10 FOR COUNT=0 TO 7
20 READ NUM
30 SUM = SUM + NUM
40 POKE 49152 + COUNT , NUM
50 NEXT COUNT
60 READ CHECK
70 IF SUM<>CHECK THEN PRINT
"ERROR" : STOP
80 PRINT "FINISHED"
100 DATA 102,101,103,104,105,106,
107,732
```

This sort of loader is used in *Your Commodore* every month. Every line has a checksum on the end, the total of the numbers that have been read being worked out in line 30. This is then compared with the checksum, READ in line 60 and compared with SUM in line 70. If they aren't the same then the computer reports the error and STOPs.

Let's RUN this program and see what happens. You should get an error message 'ILLEGAL QUANTITY ERROR IN LINE 40'. Your immediate reaction is to check line 40. But there's nothing wrong with this so what is the problem?

An ILLEGAL QUANTITY ERROR means that a number has been used that is too large. So let's have a look at line 40. In this line was POKE 49152 + COUNT with the number that has been READ from the data statement. The maximum value that 49152 + COUNT can reach is 49152 + 7 (see the For Next loop in the first line) which is 49159. There is nothing wrong with this so what about the number that has been read? You can only POKE a number up to 255 into memory. What must have happened is that you are trying to POKE a number greater than 255 into the computer's memory. If we tell the computer to print this number out when it stops with an error message our fears will be confirmed. RUN the program again and then type the following line when the program stops:

```
PRINT NUM
```

The computer should respond with 732. Hence our illegal quantity error. Yu can only POKE a number up to 255 into memory, remember? So what has gone wrong? Let's follow the program through.

Line 10 is a loop that repeats eight times count going through 0,1,2,3,4,5,6 and 7.
Line 20 READs the next number from the data statements.
Line 30 adds this number to the current value of sum.
Line 40 POKEs the value that has been read into memeory.
Line 50 goes back round the loop eight times.
Line 60 the checksum is read.
Line 70 the sum is compared with the checksum and the program stops if they are not the same.
Line 80 is the end of the program.

So what is our problem? Eight pieces of DATA are read, the sum is then read and the program should end. If you take a close look at line 100 you will see that there are only seven pieces of data and the check sum. This means that instead of the last number being read and POKEd into memory the program READS the checksum and tries to POKE this into memory giving you your illegal quantity error. The number 108 is missing from line 100. In this case the fact that a number was missing from line 100 was easy to spot. After all we only have one line of DATA in the program. How would you cope if there were 600, 700 or more lines of DATA? How could you find the line where the DATA was missing?

System Variables

The designers of the Commodore series of computers use certain areas of the computers memory to hold information about certain things in the computer. The following memory locations hold the line number of the last DATA statement:

63 & 64 on the C64, C16 and Plus/4
65 & 66 on the C128

The line number of the last DATA statement can be found by entering the following line:

```
PRINT PEEK (63) + 256* PEEK(64)
```
or
```
PRINT PEEK (65) + 256* PEEK (66)
```
on the C128

Re-Run the above program, when the computer stops with the error message try the PEEK and you will find that the number 100 is printed – the line where the error is. So now you can find where in your program the computer is READing DATA from even if there are hundreds of lines.

Correct Version?

Let's correct the above program and see if it works. Re-enter line 100 to read:

```
100 DATA 102,101,103,104,105,106,
107,108,732
```

RUN the program again and all is well, or is it? The computer comes up with FINISHED and no error messages are printed so everything shoudl be OK. Well I'm afraid that it isn't.

Adding Up

The main failing of this type of program is that the check on each line is simply a sum of all of the numbers. Therefore 3+2+1 would give you a checksum of six. However 2+3+1 would also give you six even though the numbers are not in the correct order. If these numbers were part of a machine code program, the fact that they could be in the incorrect order may cause the program not to work correctly or even crash. The golden

rule here is simply 'Do not assume everything is correct even if the computer says it is'. To prove my point the above program still has a fault. Line 100 should read:

100 DATA 101,102,103 etc.

However it actually reads:

100 DATA 102,101,103 etc.

The sum of the DATA may be the same but in machine code the two lines would mean something very different.

So if your program doesn't work then CHECK THE DATA.

Trivial?

You may think that the above is simple, well it is. However, since around 90% of the program queries that we get in the *Your Commodore* office are due to one of the above faults, it's obvious that the simple things are quite often overlooked.

On From Here

At *Your Commodore* we try to publish high quality programs that are of benefit to as many people as possible. This generally means that the programs are usually very large and often prone to typing errors. In order to make your life easier we are starting a 'Bug Finding Service'. If you have typed in one of our programs and despite much checking still can't get the program to work then send to us the following:

Two copies of your program on tape or disk
A description of what your problem is
If possible, a listing of your work (can be omitted.)
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Should any of the above be missing then we will not be able to deal with your query.

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Do not send a program to us as soon as it stops working, check it yourself first, if you don't it only wastes valuable time that we could be spending working on the magazine.

We do get a large number of queries in the office so it may take some time for your query to be processed.

NOTE: we can only deal with queries on programs published in *Your Commodore*.

Telephone Calls

It is very difficult to deal with programming queries over the telephone since we cannot see your programs or what you are actually doing. Since we are starting the 'Bug Finder' service we will not be dealing with any program queries over the telephone, this will make life easier for both you and the people working in our office.

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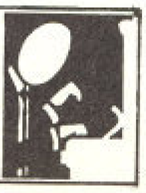
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B R E A K

Caption Competition

A crispy fiver for the person who creates the funniest comment from Brian Jack's dad. He's the one who's being flung about in a very undignified fashion. Send your entry to: Brian Jacks Caption Competition, *Your Commodore*, 1 Golden Square, London W1R 3AB. Closing date: 31 January 1987.



C16 Sound Sampler

It has come to our attention that a number of you are having problems running the C16 Sound Sampler printed in our November 1986 issue.

Two problems have come to light, the first is that people don't understand how the programs work, the other is that it doesn't seem to work on all machines.

If you make the changes below and follow the instructions then you should have no problems using the program.

1) LOAD and RUN RELOCATE.
2) LOAD SAMPLER PT1 and RUN it.
3) When finished, this will SAVE a new program with the name 'SAMPLER' to disk or tape.
4) When this is finished turn the machine off and on and then LOAD SAMPLER PT2 and RUN it.
5) This will then create a file called SCRN on disk or tape.
6) Turn your machine off and on. Now LOAD SAMPLER and RUN it, this will then LOAD SCRN and the program will work.

I hope that this solves all of your problems.

SAMPLER PT2

```
1380 L=L+5:AD=AD+8:IFL=1425THEN1390

1400 DATAA9,01,A2,00,A0,01,20,BA,02C7
1405 DATAFF,A9,04,A2,24,A0,06,20,0338
1410 DATABD,FF,A9,00,85,D8,A9,08,0473
1415 DATA85,D9,A2,FF,A0,0F,A9,D8,052F
1420 DATA20,D8,FF,60,53,43,52,4E,038D
```

Winners

There were 25 winners in our Nexus Competition. The top prizewinner is L.M. Vincent from Hildenborough in Kent who will receive a video digitiser and a copy of the Nexus game. The 24 runners up will each receive a copy of the game. Their names are: Andrew Cobb, Yardley; David Ferguson, Clydebank; Verdun Wyn, Gosport; Shane Parris, Abergavenny; T.J. Williams, Southsea; S.R. Biggs, Huntingdon; D. Lockie, Aldershot; John Consadine, Ferriby; Nigel Barker, West Croydon; P. Smith, Sheffield; Adam Wright, Thorpelands; Jonathan Andrews, Newark; Joseph Mahler, London; Nigel Rawlins, Orpington; Greg McNelly, Taunton; R. Ward, Deptford; Brian Carlson, Amstelveen, Netherlands; Tony Moore, Maidenhead; Fergus Pirie,.

1. You move from corridor to reception.
2. De-code guard to corridor.
3. Secretariat guard to de-code room.
4. You to secretariat.
5. Transmission guard to reception.
6. Encryption guard to transmission room.
7. You to encryption room.
8. Secretariat guard to secretariat room.
9. De-code guard to de-code room.
10. Transmission guard to corridor.
11. Encryption guard to reception.
12. You to transmission room.

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Advertisement Copy Control: Laura Champion
Origination: Ebony Typesetting
Design: Argus Design

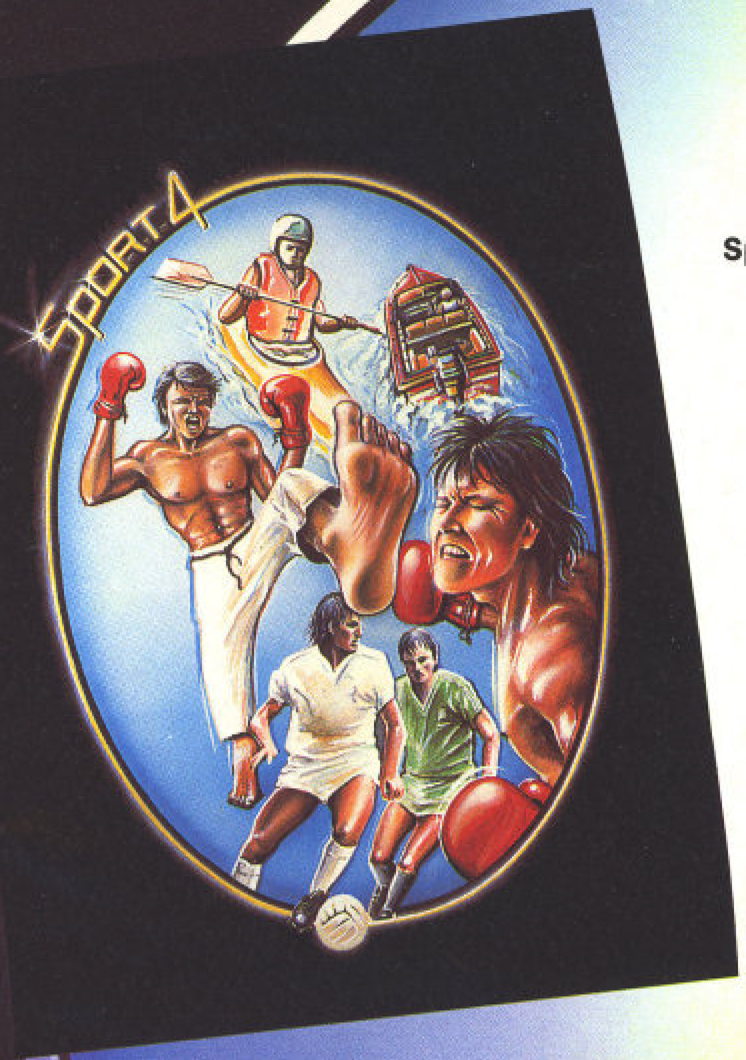
Your Commodore incorporating Your 64 is a monthly magazine appearing on the first Friday of each month.
Argus Specialist Publications Limited Editorial & Advertisement Office, Your Commodore, No 1 Golden Square, London W1R 3AB. Telephone: 01-437 0626 Telex: 8811896.
Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.

Distribution by: Argus Press Sales & Distribution Ltd. 12-18 Paul Street, London EC2A 4JS. Printed by: Alabaster Passmore & Sons Ltd, Tovil, Maidstone, Kent.

ISSN 0269-8277

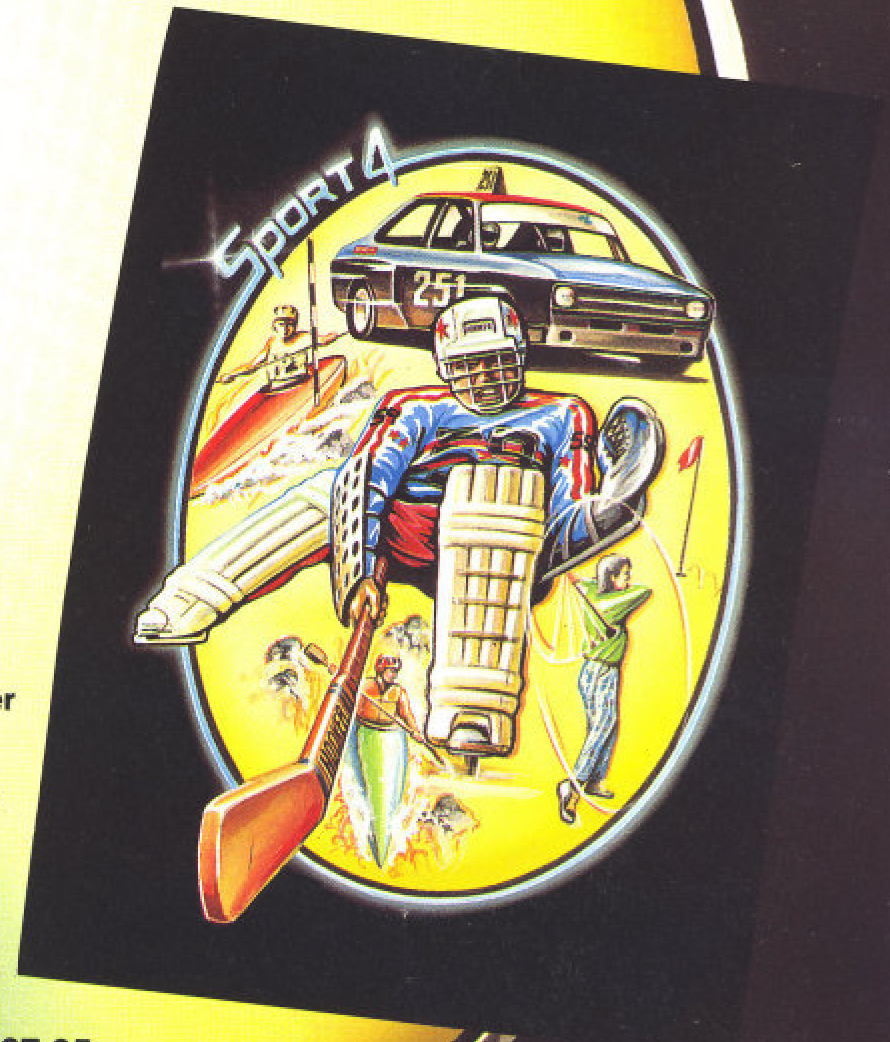
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